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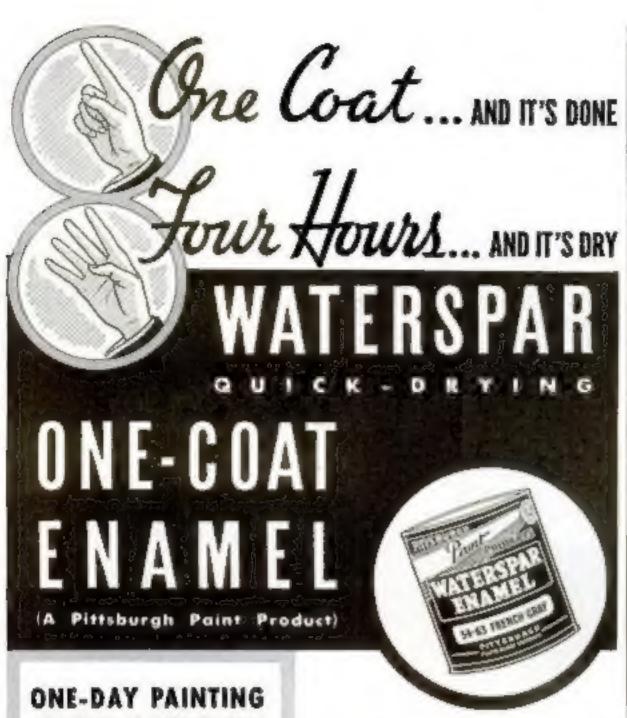
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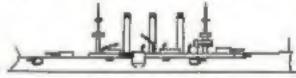
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Select the model according to the time you can give the work and the person for whom it is intended. The simplest of our models, and those which require the least time to make, are listed under the heading "Model-of-the-Month Kits." The Saunty and the illuminated show boat are excellent gifts for either men or women; the various warships appeal to men and boys; and the little Hispaniols, which can be made in a few hours, is a fine gift for any child who has read Treasure Island.

The models listed under the heading "Simphilifed Ship Model Kita" take only a little longer to make. The See Witch, a picturesque clipper ship, appeals to both men and women, and the Manhattan and Indianapolis to men and boys.

The standard kits are larger and require considerable time to work up into models, but they are, of tourse, correspondingly valuable.



KIT T-U. S. S. Brechlys

The Spanish galleon, the Elicabethan galleon, the Constitution, and the Sovereign of the Sens are splendid pits for either men or women; the others may perhaps have a slightly greater appeal for men, although they are all highly decorative.

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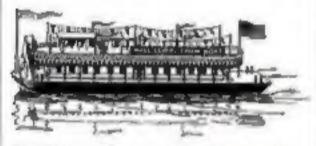
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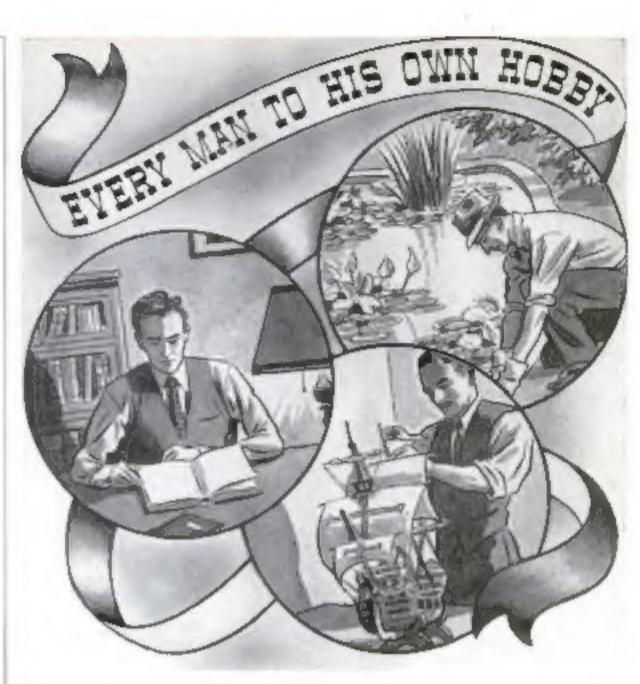
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planned a future in which he will spend more than his Saturday afternoons around his kennels.

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MOTORISTS WISE



REENFORCED "planks" of gypsom form the latest material for the construction of fireproof flours and roofs. Bound on the edges with galvanized steel, and tongued and grooved like ordinary boarding, they can be laid easily over either wood or steel joists or beams. The material can be cut, nailed, or bored with ordinary tools and can be fastened in place to beams and joists with metal clips. Sold in several widths and two thicknesses, the planks can be laid in standard lengths regardless of the location of supports, minimizing cutting and waste. Besides being durable and fireproof, the material also is a heat insulator. The gypsum used is a laboratory-controlled product of extra hardness and density,

REAMING TOOL RENEWS WORN WATER FAUCETS

WHEN a water faucet leaks, it is not always a sign that the washer needs replacing. It may mean that the valve seat is so worn, or so encrusted with scale, that the washer cannot make a tight fit. As a remedy for this trouble, the inexpensive faucet reamer shown at the left has recently been placed on the market. Installed in a compression-type faucet in place of the regular stem and given a few turns, its cutter head smooths the worn

reaming process; an adjusting nut and the threaded shank provide an automatic feed. A single reamer will serve the needs of the entire home, as the one size in which it is offered is designed to fit ninety percent of the compression-type faucets in common use.



NEW TILTING WINDOW IS EASY TO CLEAN

By means of a new system of hanging. windows now can be altered so that they can be pulled completely inside the room to allow easy cleaning and repair. The necessary hardware and fittings, sold in kit. form, can be applied to any double-hung window by any one handy with a saw and hammer. In winter, they allow the outsides of the windows to be cleaned from the inside as shown below and their special, tight-fitting construction makes them draft- and weather-proof when in place. Similarly, they provide any degree of ventilation in summer. According to the designer, the conversion cost is little more than that of a weatherstripping job.



uestions

FROM HOME OWNERS

Q .- How can I test for a leakage of sewer gas?-TOF, Ch cago, IL

A,-Make up a special test paper by souking a piece of soft paper towel in a solution made by dissolving one nunce of pure lead acctate in one half pint of distiled water. The paper will turn back in the presence of sewer gas.

Firing a Furnace with Coke

G. D. WHITE PLAINS, N. Y. When using coke or soft coal, do not cover the en tre coal surface with fresh fuel. Put the new coal on in front, leaving the glowing coals visible at the rear

Weathering New Shingles

P. C. S. RICHMOND, VA. When new shingles are used to patch a roof, they should be given an artificial weathered appearance so that they will match the old shingles. This can be done by applying a thin stain consisting of half Imseed oil and half turpentine and enough dry color such as burnt umber or lampblack to give the desired tint. Asphaltum. thinned with turpenting also will serve



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By J. E. Thompson, S.S., A.M., Dept. of Mathematics, Pratt Institute

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Our Readers Wants Her Dubes To Vanish After Each Meal

IN LAST month's issue of your magazine, I read about an electric grunder that had been perfected to replace the garbage can. Everything from watermelon rind to soup bones,

anys this item, is reduced to such a fine pulp that it can be washed down the drain without clogging the piper, This will certainly he a boon to us women who must do our own kitchen drudgery. With such a device installed in my kitchen I whiled ask for only one more inhovation-a substitute



for our conventional dishes which must be washed and dried three times every day. I know there are paper dishes on the market but these are in such a form that their use is, to my the least, unappetizing. Why can't a dub be made from an inexpensive, nonabsorbent material that can be fashioned into a pleasing form? If these were available, then after ruch meal they could be disposed of via the electric grinder-I hope to get Yes, you've guessed if I have to wash dishes. - Mrs. C.M. L., Newark, N. J.

Spinning Shaft Leaves Him In Bit of a White

Wreg you publish this letter in your magnrine to that I may get an explanation from some of the readers as to why the absolute center of a spinning shaft must stand still ? I have had numerous arcuments on this subject and somehow I am unable to convince many that such is the case. In fact, I can hardly perceive the phenomenon myself but know it must be so. What proof will some reader offer? W. G. Van N. Jackson, Mich.

Here's One Thing That Goes to Pieces on a Soft Job

HERE is a question I would like to mak the renders of POPULAR SCIENCE MONTHLY Bullets have a queer way of behaving. Use a highspeed, lightweight bullet, such as the ,250 Savage, to shoot a small amonal weighting about twenty pounds and the bullet will so to pieces-and so will the animal. Shoot that same type bullet at a steel plate and it wilnot go to pieces. If the plate is not too thick,

it will penetrate it, leaving a next bole, and travel on Fire the same type bullet at the lean, hard shoulder of a tion and, it is reported, the soft point of the muscle will penetrate about as far as the full jacket. Shoot a deer in the soft abdominal area and no part of the missile as



large as a No. 2 shot will be found. Will somebody tell me why a rifle bullet explodes and flux to flinders upon striking soft substances but remains intact when encountering harder substances?- J.F. N., Wilkes-Barre, Pa.

Window-Crashing Bird Fights Its Own Image, Says Reader

Test fixbling of a robin with its own mage in the window mentioned in the Dur Readers Say of a recent usue is explained by the iterritors in bird ale theory. That is, a bird takes possession of a small registery around its nest before and during the breeding season and keeps out at in suders. An interesting examine in support of this theory recently heard his the writer concerned a cathord. The hird having a nest in a gazden, would strive to drive away its own image present in the window of the house located on the same grounds But its own image reflected in a class just over an inchoing wall would not excite it. The latter, presumably, was out of its territory.-B.J.B.,

What Will the Children Use For Swimming Floets?

MANY stems which we use daily have been progremively improved in efficiency and design but these improvements are usually made without charging the medium For example, take the automobile tire. A better and longer lived pneumatic tire has been the result of

years of research. But why toncentrate, as apparently has been the case, on MAY, LAY OFF / pneumatic tires? Why not Iry some new wrinkle something theogyentionni? What I have in mind is a permanent frame to fit on the wheel of an aulomobile This frame would be adequately equipped with shock absorbing devices. The outer surface of the frame would



be covered by a ressaveable tread, rubber or another substance. The tread should be such that it can be produced cheaply, has good restatent properties and is serviceable for 4,000. or 1,000 miles. With such a tread and arrange. ment on the market (the tread setting for about \$3, for the smaller sizes), an autoist could afford to buy three or four sets of treads a year and would save money in so doing. Sort of ake stopping in the shoemaker's to get a new pair of rubber heels. Maybe there's a catch somewhere in this idea but I can't forser any real obstacle. I would like to know what some of your inventive auto owners think of this suggestion.- A B.O., Fluit,

Perhaps You Need Murrors To Do This One

A PPILNO of mine states that it is possible to take any prime number, see it three times in the correct mathematical calculation, and the result will always equal twenty-four. The appearance of the number in the equation constitutes its use, such as, 22+2-24 or 34-3

24. My friend declines to show me his solutions but assures me that he has worked such problems with all the prime numbers up to and including 19. Maybe some of the mathematical sharks among the Readers Say fans can tell me whether I'm being taken for a

mathematical alogh ride or if the numerical calculations can actually be worked out to give the answer 24 each time?-E.J L., Grand Rapids, Mich.

For a Whittling Diet, He'll Take Frogs

Your whittled model is a fine idea. Why not more of it-some real model carving?

How about some real. lifelike patterns of frogs in different sizes, k nris, and positions A free a an all b one mere un of whit ling can be carried around in your pocket, and can be worked on when you feel like it. You can sit nutdoors and need not be cooped up in a shop. If the model is made so that it may be used as a



pattern (will draw out of the sand), the frogsmay be cast in metal. When painted in natural frog colors, they are not only ornamental but meful as doorstons, book ends, paper weights, and many other household articles. A big bullteog, atting with his mouth open, makes a novel ash tray or cigarette stand .- R S W Elverson, Pa.

Giant Radio Tower Causes Rift In Overhead Clouds

A ratemp of mine lives about twenty miles east of the 831-foot vertical antenna of radio station WLW. He has noticed that since the erection of this tower all low-moving clouds seems to split while over the structure and then join together again when they get nearer his point of observation. What is the answer to this phenomenon? We have heard that rain clouds are supposed to carry an electrical charge and we are wondering if the clouds could be repelied by the electrical charge from the towering antenna .- B H . B. anchester Ohio.

Harls Skunk as Inventor Of Chemical Warface

Accounted to the newspapers, the Et alpians are plantung to draft civet cuts for active military service. These formidable creatures, which have a defensive strategy resembing that of our own skunk, will garrison water

holes and lay down burfaces to arm a thirsty. invaders. It seems that hature was the bist in ventor in the field of warfart, all our beasted "modern weapons" have their counterparts among fishes, birtls, and ani-mals, Camouflage was brought to perfection by the chameleon, the squid was using a smoke screen when bumans



thought the trireme was the last word in naval warfare; the turtle and the armadalo blazed the trail for the tank. As for chemical way-

fare, look at the skunk—through field glasses. It's a wonder the Indians weren't smart enough to conscript the woods-pussy If they had, the Pilgrims would not have lingered long on Plymouth Rock but would have made a hasty retreat to the Maylower and left this country in the hands of the 100 percent Amertrans.-I.J., Knoaville, Tenn.

Sees New Power Age as Waiting Until New Fuel Arrives

THE article, "Diesel Engines Usher in New Age of Power," was a timely one but I do not think that it shows how the Diesel is going to

play fix coming rule of power king. As long as it must use all for fuel. it cannot circumvent the abstacte of high fuel costs any more than the guadine engine can. I hel eve most readers with agree with me that in the event of the general adoption of Diesel engines, the cost of fuel ou win rise in proportion to the demand. While this



factor was mentioned in your article, it was, I believe, underemphasized. Therefore it is my heisel that the factor which will usher in a new power age will be a cheaply produced fuel from a limition vegetable source such as cell alose. When such a fuel is developed, I am confident as engine will be perfected to utilize it efficiently and inaugurate a new age of power.—S.TY., Ruchester, N.Y.

When Is a Surface Not a Surface, He Asks

CAN some one point out a way for me to get a cear conception of the geometrical dimensioniem point, line and plane. Any point I can imagine is a volume, no matter how small. Any line is a "row" of these small volumes excepting only the paths of motion which I can mentally picture. I can imagine no plane whatspever detached from volume. Length, breadth and thickness seem like unrest measures because, to me, if they are not all there together, there isn't anything there. I understand what the geometrical and algebraic formulae and calculations are driving at but find it impossible to imagine (in the application of these first geometrical concepts to the actual material world) length and breadth without any thickness, for example. A surface is very real and actual but never a surface by itself. When I conceive of any nurface, I perceive a volume or solid of which it is always a part. Remove either the length or breadth or thickness and there is nothing left .- W J L., Hartford, Cons.

Urges Gus To Consider The Fellow With a Motor Cycle

As a reader of your magazine, I am, on the whole, very well satisfied Though there are a number of things I have little use for, I like to look . I them and I figure that they are just what some other fellow is looking for I am particularly interested in the monthly article about Gus Wilson and

his Model Garage, and also the woodwork no and traftwork projects. I want to make a request that you persunde Gus to write an article about the opkeep of motor cycles and their ailments and cures. This may appear to be a peculiar request but I am sure there are numerous



motor-cycle riders among your readers who

would appreciate such an article.-H.H., Agua Dulce, Texas.

Seeks Enlarger That Reduces His Pocketbook but Little

Mr. Rypen's articles on photography, I think, are A-1. I have been hoping that he would write an article telling how to build a sample enlarger say something to hitch onto a roll film or film pack camera. I have found that the proces of most enlargers run high when the buyer is just going to use one for his own work with no intention of becoming a professional, Perhaps some of your photofan readers have solved the problem and would puss their solution along to the rest of 28?-PB M., Manonville, Mo.

Saus R. H. to R. H. You're Wrong About Evolution

I wast to voice my disagreement with the letter of R.H., Edgewood, Ps., in Our Readers Say of a recent issue. R.H. suggests radioactivity in an evidence of evolution but radioactive elements are being broken down into base metals (finally lend) at a much faster rate than they are being produced. This is a process of degeneration and not evolution Even to explain the mere evistence of radium, uranium etc. the evolu-not must flee in a the barry, abysmal past behind the supposition that the processes of radioactivity were once opposite to what they are today If evolution of the elements has occurred, it would seem reasonable to suppose that somewhere in space bodies would contain elements not found on earth. Dr. Harlow Shapley of the Harvard College Observatory says, however, that the chemical elements in the most distant nebulae are identical with those on earth. Burbank and

other scientists produced many new varieties but not new species. The primitive men, referred to by R. H., comest large. ly of plaster of Paris and imagination. From a lower jaw is constructed Mr Heidelberg with his gorilline cranium despite the fact that jaw bones of the natives of New Calestonia, who have full-sized brains, are de-



codedly similar in general characteristics to those of the Heidelberg man. When the Piltdown fossils were submitted to different experts for reconstruction, there resulted as many types of skulh as there were experts. These and many other similar cases give us reason to doubt seriously the authenticity of "missing links."—R.H., South Sutton, Mass.

Can't Get His Balloon Off the Ground

I move this letter will attract the attention of one of our readers. I have made several attempts to inflate a rubber balloon with homemade hydrogen. I was able to inflate the balloon but it would never rise after it was indated. I think that a spray of hydrochloricand vapor gets into the haloon and makes it the heavy. Will some reader please help me out by suggest og a way I can overcome this deficulty? I have been a reader for many vears. Keep up the good work on your chemstry and radio pages.-P. K. Omaha Nebr

Seconds the Motion For Flag To Banuh Armer

Uron reading the letter of T C M., Middletown, Ohio, in the September issue concerning the flag to protect art. I decided to send in remarks I wrote after reading the article about the adoption of this flag. It is too had the League of Nations spends time figuring on a flag to protect art in case of war. I am sure the mothers of the various nations would much tather have a flat to protect their

homes and families. If the home is protected to a the peace of the world. Posterity may say "What fools these mortals were! Saved their art and siew the best physical and mentac powers it were possible for us to inheri!" That is, if the descendants of the feeble minds and bodies left after another war would ever advance to such thoughts .- H.H., Turson,

Maybe the Trip Down Is Worth the Trouble Going Up

Nor long ago I read an account telling of the observations by antarrise explorers of a

Queer habit which penguens have Great nambers of these birds, it is reported was climb to the top of scebergs, somet met as high as 100. feet and then slither down the ice to the buttom. As soon as they reach the bottom, they again begin to work their way to the top, only to slide later to the bottom. More recently



I read a newspaper item telling how the pengums in the New York Aquarium are let out of their inclosure after viating hours and these captive hirds promptly begin climbing the stairs leading to an overhead gallery, Surely there must be some biological reason for the upusus habit of climbing by a bird which is poorly equipped by nature for walking I would be greatly interested to learn what scientific explanation some biologists among your readers can offer for this appear entity purposetess effort expended by pen-guing. H.W. Scrupton, Pa.

Flag To End War Gets Razzberry Salute

I cot a laugh out of the letter of TCM., of Middletown, Ohio, which you published in Our Renders Say under the heading of "A Flag To Make Armies Disappear." This optimusic pacifist suggests a flag that would say e is "that the occupants of the dwelling or bur ding flying it were not in sympathy with the war activities in progress and, as such, were immune from attack." What difference would it make to no enemy army or a friend ly one, either, for that matter) whether T.C. M was fan sympathy with the wartike activities or not? You can't stay a general on the wrist I suppose that if TCM were in the path of a hurricane, he would hoist a flag to signify that he was "not in sympathy with the almospheric disturbances in progress But would be be immune from his ng bis house blown over two the next county? I donot it - K C , St Louis Mo.

Doesn't Need Microscope To See the Dust

I make a laboratory in which I carry on various types of microscopical experiments and up to the present time I have worked out for myself all the seeming difficulties encoun-

tered in keeping a labgravory ordered and in taking good care of the equipment But now dust has me Being a stumped teader of Our Readers Say Lam weiting with the thought that perhaps some reader can help me out by letting me in on the secret of how he succeeded in combating dust. The



readers of P.5 M., I feel certain, are about unan mous in their belief that the articles on microscopy should continue (C.C.) Burn ogaine. Caudi

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POPULAR SCIENCE

RAYMONO J. BROWN, Editor

Lighthouse Keepers of the SKY

LONG the vast, 20,000-mile betwork of American airways, lonely little lighthouses play their vital part in our new air commerce. Amid mountains, in forests, on deserts, airways keepers at emergency fields send out their signals night and day. With radio beams and beacon lights, they guide tons of flying metal through the sky.

The drama of the air is known to all. The drama of the ground—the battles against wind and sleet, heat and bluzzard, rattlesnakes and lightning, that enable these men to keep their signals flashing—is known to few. In lighthouses of the air, the grit and courage of the keepers is carrying on the age-old tradition of lighthouses of the sea.

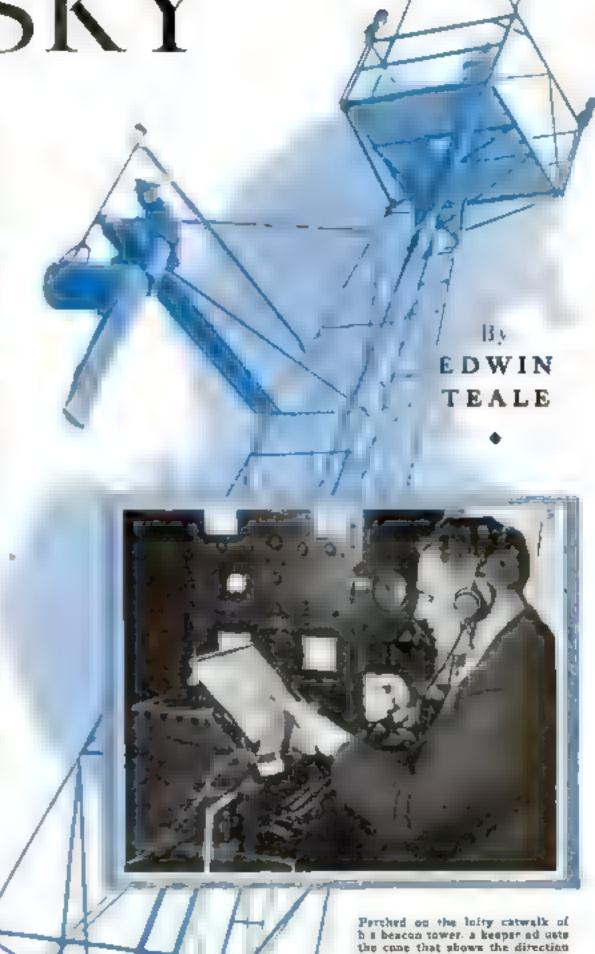
Take, for example, Charlie Merchant's battle with a blizzard in Southwestern Wyoming

Merchant was on duty at the lonely Knight station when the storm broke. All the way from Porcapine Ridge on the east to LeRoy on the west, the air was seething with snow. Rushing toward the bizzard at more than two miles a minute was a passenger plane of a transcontinental line. Over Porcupine Ridge, it disappeared in the whirling clouds of snow, following the radio-beam signals from Knight.

A few minutes later, Merchant picked up a message from the plane. The receiving set was dead. The pilot was calling the mis-line office at Salt Lake City for help. He would circle where he was, he reported, until another liner arrived to lead him through the storm. As Merchant heard the second ship radio it was nearing the ridge, there was a rasping sound in his range receiver. The beacon signal, upon which both ships now depended, was out of order

Rushing from the station, Merchant found that an aerial wire had snapped in the cold and grounded itself in the snow. From top to bottom, the high radio tower was a sheet of ice. Merchant

This Vivid Article Tells
Of the Adventures of the Men
Who Keep the Signals Flashing
Along Our Far-Flung Airways
To Guide Traffic in the Sky



of the wind. In the smaller picture, a weather report is being

transmitted to a plane by radio

hagged the ladder and, with the gale howling around him, worked his way uphe grazed rungs. At the top, he improvised a temporary space which kept the sumuls on the air and guided the passenger planes to salety.

buch dramatic jobs are often port of the day's work for an arways beacon keeper In the crisp language of the service, von find on the record books of the various stations similar tales of grit and daring. One man, for example coung to a rocking tower for three limes a high wand to keep his Apptha in his his de state and a second 143 - 1 h - 1 main ained for emergencies by the U.S. Description of Commerce the men in in go are constantly on their foes agest or troubs

When the Government can have e the histance and the state of reases the land from the weather a als a fire or as a second contract of second of the country and often ; . . seed stated to the soil and clima plan ed to give the field a soud turl. knocked-down buildings, which can be consported and set up easily are used

as many fields.

Pypical of the larger stations is one at McConne islance on the mountains western Penniylyania. Its field stretches north and south between two ridges that rise 1 000 feet above it. At the north eastern corner a high reduct solver laser st iports the light bea on ag houses the teletan meleurological equipment and a small r shed contains the apparatus which sends out by me o at regular intervals the men-Hyang etter of the station

Purce men comprise the star a day held. Charles E. Irish, the previous known er in charge is a veteran of the Core Guard. The two assistant keepers and Robert Johns, a former racin operator transat antic fankers, and J. R. Simp a Bureau of Ar Commerce man !--Sanjury Pa. Every minute of the daand right one of the men is an duty

Requirements for job of an airways keep er are physical rea general knowledge of mechanics, and expe rience as a radio opera tor Salames eur \$1.2 D to \$ and men Civil bervice examinations. They handle messages over the teletype Total V Total T N A STATE OF STREET to the first to th The second of the second COLD 1 COLD OFF A F S To wat offer 7 92 M 5 995 GE 5 17 4 No. of the second . 4

Not long ago, for ex ample McConnellsby ... was the scene . . throlling battle to a a life plane from the





tutvalu. The o

A keeper replacing a lamp in a boundary n is a serious of an age to t

. Forced down by bad weather a monoplane carrying gas bumbs for in a prison riot side-supped into the field, rocking in the gusty mr. Ha v. had the wheels stopped rolling when the pounding side gusts threatened to ove m and wreak the ship. Both the pr d the airways keeper baitled to anch i 6.1 its tal in o the wind and security i a stakes and rope

1 3 3 1 from part a glypicy probt its a refer fratite sat down on an emergency field bear Medicine Bow, Wyo., with his gasoline tanks virtually empty. As soon as his plane came to a stop, he leaped out, grabbed a wing tip, and attempted to hold down his ship. But his weight was insufficient. At every gust, the light muchine rose from five to a dozen feet and sailed backward across the field with the pilot clinging to the wing. The airways keeper rushed out with ropes and stakes. Hawever, no sooner would be begin driving a stake into the ground than the plane would sail backward another hundred feet and he would have to start all over again.

The owner of the ship was almost ready to abandon his plane when one of the assistant keepers drove his car on the held and tied a wing tip to the humper This held the plane steady until a secand auto could be brought and secured to the other wing. Then the plane was towed to a sheltered spot and anchored

down. As an aid to such work, the Department of Commerce is now distributing a new type of anchor, Made of fron, it bores into the ground for aix feet or more to give added holding power

At the McCoonellsburg emergency field autogiros have drifted down in logs, passenger ships have swooped to a landing in anowstorms, light planes have come down for gusoline. Army bombers have landed in gales and ships with their radies out of order have dropped in to get reports on the weather shead. Frequently, private planes with small receiving sets but no sending apparatus will swing over the field and give their engines three blusts. That is the signal for the latest weather reports. The man at the micro- "their horse toward the light, they let their

phone broadcasts the data to the plane above and, with one blast of his engine to express his thanks, the palot flies away

Not only airmen, but others as well are now making use of reports from airway stations. In the Middle West, a power company listens in on the weather reports every day to get Ups on coming storms and early dusks which will mean peak loads for electric current. Steamship lines are getting the weather data for passengers coming into port. Motor clubs and to my stations are supplying fourists with similar information and a railroad dispatcher in the Northwest uses the reports to tell whether trains on long hauts will be bucking head winds. This helps him forecast late and early arrivals.

PROBABLY the queerest of the odd uses to which the airways service has been put is one reported from Utah.

Last summer, the continued dry weather lowered the water in Great Salt Lake until the revolving beacon on Antelope Island could be reached by wagon instead of by boat. Airways mechanics from the mainland loaded fresh tanks of acetylene gas into a wagon and beaded out over the dirty white crust and the shallow water of the lake bed. By the time they had finished servicing the beacon, night was

Starting back over the flat surface on their seven-mile journey home, the men had no fandmarks to guide them. If they got off the track in the darkness they might sink into a hole or be mired in a soft spot. However, far ahead, they saw the recurring flash of a revolving beacon It was the mainland station from which they had come. Pointing the nose of

own beacon guide them home in safety!

Recently, at the larger airways fields, the government has been installing a newtype radio beacon. Instead of having antenna wires at the top of the high towers, it has them buried in the ground. So sensitive are these installations that an automobile driven on the field near-by may interfere with their proper operation,

In the South, last year, one of these beacons developed mysterious trouble. It was finally traced to wandering rows. The animals were coming near the towers and upsetting the adjustment of the transmitter. In the end, a fence had to he built around the installation to keep the cuttle away

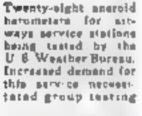
Even stranger was the source of disrapted service at Amarillo, Tex-

One spring, thousands of large, brilhantly colored maths invaded the field. They fluttered about the lighted windows of the radio shed and conted the outside of the building. For weeks, they con-tinued to come. At the same time, fuses began to blow out and pilots reported the radio beacon signals were out of order. Every source of trouble was thecked and finally the men at the field discovered the clustering moths were grounding the antenna wires, causing short circuits and loss of energy

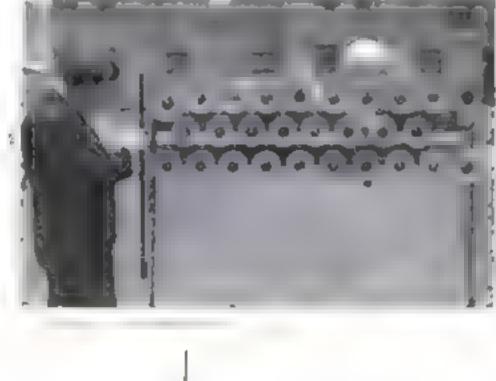
Even after the cause of the trouble was discovered, the remedy was far from easy Charles Irish, who was stationed at Ameriko at the time, went up and swept of the moths with a broom. They came back as fast as he removed them Then he sursyed the insects with poison Others took their place. Finally, he installed a brilliant light on a post a hundred yards from the radio shed. This at tracted the moths and eliminated the

> curious cause of the trouble Overcoming the unexpected by ingenuity of this kind is a feature of the atrway keeper's work. The cardinal rule of the service is: The signals most stay on the air

Not long ago, at a station in Iowa, emergency repairs were made with a rubber band to keep an automatic broadcasting apparatus working. The spring bracket on the key which makes and breaks electrical contact in such a way as to send out the identifying code letter of the station at twelve-second intervals, (Continued on page 111)



Below in shown the combined radio cummultical obstand radio range beacon station ar El sabeth, N. J. It. a controved from the aicport at Newark







ARNUM and his freaks-Tom Thum: Zip, Jumon Jo-Jo, and a host of other oddities made famous by the great American showman-will come to life in a unique exhibit now accoung completion in New York City.

All of the figures, from the two-foot Tom Thumb to the thirty-foot whale, will be exactly life size. They will move, breathe, and many, through sound effects, will talk. The whole exhibit, which will be near y half a block long in being prepared by Messmore and Damon, creature of "The World A Mid-on Years Ago" attraction at the Century of Progress Exprecision in Chicago.

Visi ors will walk down asses between the various mechanised figures as though they were in Barnum's American Museum, three quarters of a century ago.

They will see the Cardiff Gunt, the "Fejee" Mermaid, the Woolly Horse, the Russian Giant. They will see "The Only Whale in Captivity open and close its mouth spout water and splash its tai, in the huge tank. They we see the Fn Lady a quarter ton of feminine charm," fanning herself and breathing realistically They will hear the charter of Zip. "The terest What Is-1 4, the roar and sund of bons and tigers, the tribal chares of "The Congress of American Indians.

The Rubber-Skinned Man will show the way he can stretch the skin of his chest and sides. The Stamese Twins will hold a conversation. And, the Tattoord Man will tell the story of how he became a living picture gallery. As a final attraction, a curtain will part and P. T. Barnum, himself, will introduce Jenny Lind, "The Swedish Nightingale," who will sing one of her songs.

Most of the mechanized, life-sized figures are being formed of paper-maché braced with steel and canvas. The thirtyfoot whale will weigh more than a ton and its framework, alone, will contain more than 3,000 feet of heavy rattan,

Jumbo, "The Only Mastodon on Earth," will tower eleven feet aix inches in the air and will tip the beam at more than two and a half tons. Moving its head, lifting its great ears, switching its tail, and, at intervals, raising its frunk to trumpet, this mechanical monster will be an exact reproduction of the largest elephant ever exhibited in captivity,

Through cogs and rods, silent electric motors within the immense body will produce movements at the will of an outside operator handling a switchboard. In the smaler attractions, such as the Sword-Swallower and the Albino, the motor and operating mechanism will be located in a box below the feet of the figure,

In making the original model of Jumbo,



the experts employed more than four tons of clay. The steps in producing the giant elephant illustrate the way in which most of the animated figures are created. First the workers molded the clay around a rough wood-and-wire frame until it attained the appearance of the original animal. Then they covered the clay with puster of Paris. This was later cut away in sections to form the cast. Into the sections, the men pressed layers of wet papier maché until they had built up the desired thickness. Placed in a buge drying oven, the sections then were subjected to temperatures of from 200 to 210 degrees F. for as long as fifteen hours,

At the end of this time, the papiermaché shell was thoroughly dried and could be removed from the cast. The final steps were joining the sections, installing the internal bracing, and putting in the electric motors and mechanisms for produring motion. Then after the figures had received their fina, touches to increase the naturalness of their appearance, the work

was done

Recently, vulcanized sponge rubber has solved a difficult problem in connection with talking figures. Like the puppets of ventriloquists, they have moving jaws. The problem is to hide the joints where the jaws are hinged. In the case of the Bearded Lady, this is easy because her beard covers them. But, in planning to have Tom Thumb tell of his famous visit to Queen Victoria, the experts realized joints in the face of the beardless midget would be harder to concea.

Hy the use of the sponge-rubber musks. vulcanized on sirel molds, the difficulty has been overcome. As the law moves synchronized with the disk record which produces the sound effect, the rubber mask creates an illusion of contracting and expanding faw and face muscles, a highly readstic performance which was impos-

sible before.

Similarly, when Zip shrieks and chatters. when the Indians chant to the beat of tomtoms, when the Living Skeleton harangues the audience, the new material employed for the faces will add to the illusion of

resitty.

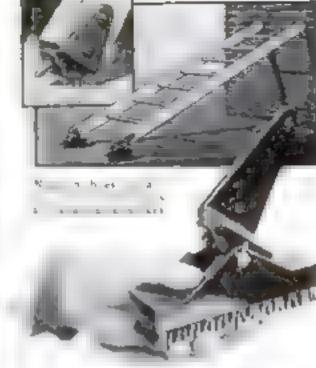
Several of Baroum's classic takes and practical jokes are included in the exhibit. One is the "Horse With Its Head Where Its Tai. Should Be." It is a horse turned around in its stall so its tail is next to the manger. Over a door at one corner of the exhibit is the sign "This Way to the Egress." When Barnum found people were bringing their lunches with the intention of staying all day at his museum, he would put this sign over an exit door. Thinking "the Egress" was another curiosity, the visitors would (Continued on page 113)





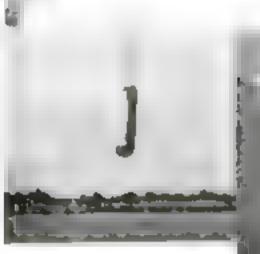
TEST NEW PARACHUTE FOR THE DOGS OF WAR

Foresterns that troops may be dropped with parachutes from speeding planes, in future wars, Soviet experimenters are trying out a similar means of landing the dogs used in army service. A recent invention is a cylindrical coop for the dog, provided with a parachute that opens automatically when it is tossed from a plane. The shell of the coop, locked closed during the descent, springs open of its own accord when the device strikes the ground. The photographs reproduced here show the device in action during recent successful tests by Soviet avastors.



LADDER SHOES PROVIDE SKID TREADS OR SPIKES

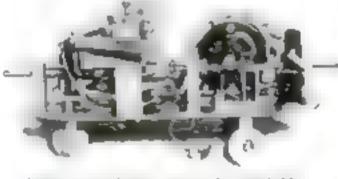
Savery shops of new design, fitted with treads of automobile brake living, can be attached to any ladder and are and to prevent it from shipping when slanted at any angle, even in oil, grease, or water hor use in icy inclines or other places of special danger, the hinged bases may be removed, exposing sharp steel spikes.



of steer property to the steer .



MECHANICAL RAT FINDS WAY IN MAZE



Driven by an efactive motor and controlled by mechanical feeders, this tobat can finds its way through the act little mass at the right

As it endowed with powers of reasoning a mechanical "rat" devised by Dr. Stevenson Smith, University of Washington psychologist, threads its way through an artificial maze like those used to study the behavior of living rata. The three-wheeled, electric-powered device moves along a grooved path that divides at several points, obliging the "rat to choose which direction to follow. If it takes the wrong turn and enters a blind alley, mechanical feelers cause it to halt, retrace its journey, and try again until the whole



course is negotiated successfully. The odd model is designed to show how automatic reflexes differ from thinking processes.

NEW PLAN PROPOSED FOR STOPPING ENEMY PLANES

For neventer against enemy air raids, a French inventor proposes a novel scheme to stop the motors of hostile planes in midair. His plan is to saturate the atmosphere with finely powdered pitch, discharged from motor-driven blowers that would be giant counterports of the small model illustrated above. Penetrating the hot motors of aircraft, he contends, the melting pitch would immediately clog them and put them out of service

Inventors of many countries have sought a way of halting airplane motors at a distance. The rumored development of various "rays" and other means toward this end however remained unconfirmed until Gughelmo Marconi, father of wireless, announced the other day that he is perfecting ultra-short wave radio apparatus that is expected to prove capable of the feat All details of the Marconi motor-stopping device are being kept sectet.

PENCIL HAS BUILT-IN LIGHT

Writtvo in the dark is made easy by a new type of self-alluminated pencil. The hollow borrel contains a flash-light battery and a small hulb, and light is directed on the writing, when a switch button at the end of the barrel is depressed through a transparent window of unbreakable plastic material at the lower end of the pencil.

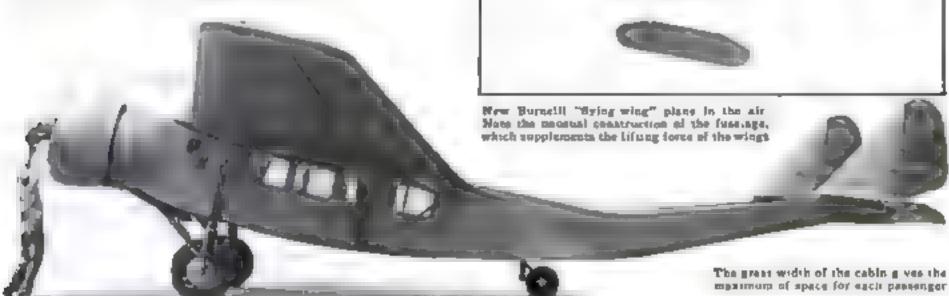


Trumparent tip of illuminared pencil and a ring lamp, Right, the pencil in me



"FLYING-WING" PLANE HAS LARGE SPACE FOR PASSENGERS

A FOURTEEN-PASSENGER "flying wing" declared to offer more cabin space per passenger than any conventional transport craft built to date is the latest creation of Vincent J. Burnelli, aeronautical engineer of keyport, N. J. The new model, he says, is suited to high-speed passenger, mail, and express service, and has a maximum speed well over 200 miles an hour Both the forward wheels and the tail wheel are retracted in flight. As in Burnelli's earlier experimental designs, the fuscing is of exceptional width and is shaped like an airplane wing, so that its lifting force supplements that of the wings themselves. The latter, spanning seventy-one feet from tip to tip, are provided with special flaps of the type known as "air brakes," which permit a safe landing at reduced speed.





STEAM BOILER FOR SHIPS RIVALS DIESEL POWER

Soon to be tested by the British Navy a new oil-fired boiler of Swiss invention may have far-reaching applications for warship propulsion. The compact power plant, illustrated above, is declared especially suited to the narrow hulls of submarines and destroyers, and its remarkable efficiency is expected to make steam a competitor of Diesel power where the latter now is used. Air and oil are sprayed at a velocity exceeding 1,200 feet a second into a combustion chamber where steam is generated to drive a steam turbine and electric generator directly connected to the boiler, The swift-moving exhaust gases superheat the steam, warm the incoming water, and yield their remaining energy in a gas turbine that pumps the fuel. Starting cold, the boiler can reach full output in only five minutes' time.

LAMP IS LIGHTED BY EEL-ECTRICITY

TO DEMONSTRATE the power of the electric cel to discharge high-tension currents, officials of the New York Aquarium have arranged a pair of terminals in a tank and connected them to a neon lamp. When the six-foot eel in the tank is disturbed. it discharges a current and the lamp glows The species uses its shock-giving power for capturing prey by stunning it, and for defense against enemies. The shock is declared powerful enough to incapacitate a horse



This electric set furnished power for a lamp, as shown in the diagram.



Double mirror in one for inspecting the back of the bead. The trame folds up

REAR-VIEW MIRROR SHOWS THE BACK OF THE HEAD

SMALL enough to be carried in a woman's purse, a rear-view mirror for inspecting the back as well as the front of the confure has been devised by an ingentous inventor. For use, the two reflectors are drawn apart, as shown at left Looking into one mirror through the other gives a view from the rear.

WATER PIPES IN WINDOWS TO WARN OF JAIL BREAKS

Pires filled with water would replace soud iron bars for jud windows, to a new plan to thwart prison breaks. Any attempt to saw through a bar would lower the pressure throughout the interconnected system, automatically sounding an alarm.

BALLOON TO TAKE GLIDER ALOFT FOR STRATOSPHERE FLIGHT ne tra a n 40 0 0 60 V we so we do us draps

Pilote guide gitder while automotic comera records data

PLANS for the first glider flight in the stratosphere are under way in Russia, where a motoriesa plane will be carried aloft by a buge balloon to a height of about twelve and a half miles and then cut loose. Enclosed in a bermetically scaled cabin, the copilots of the glider will guide its initial plunge toward the earth at an estimated speed of more than 250 miles an hour, made possible by the rarefied air of the upper levels of the atmasphere, and level it off for a gradual glide to a landing. An automatic camera, meanwhile, will photograph speed. and pressure - recording instruments at five-second intervals to provide permanent recueds Data this obtained will be of assistance it is expected, in the design of future airplanes that may be used to inaugurate transport routes through the stratosphere. During the projected ascent, the glider will be supported by a special frame within the lower part of the gas envelope, which will have a capacity of more than 800,000 cubic feet. The frictures show our attist's conception of the flight



REVERSIBLE BOAT TAKES DANGER OUT OF UPSETS

No FEAR of drowning, in case of an upset, need worry the user of a new Gorman boat, for it is practically as serviceable a craft when upside down as when it is right side up. If it capsuzes, the victim of the mishap can readily clamber to a position of safety upon the keel. An ale tank in the front and two at the back, according to the inventor, make the boat virtually uponkable



HUGE FRESCOES BRIGHTEN

To improve the appearance of bare exterior walls of a group of sportment buildings being erected in Berlin, Germany. artists recently tried the experiment of covering them with huge fresco paintings. The result is an outdoor art gallery, whose striking effect is reported to enhance the quality of the architectural design. A typical example of the large-scale works of att depicting a fishing scene, is shown in the photograph reproduced above.

PHOTOGRAPH REVEALS NEW STAR GROUP









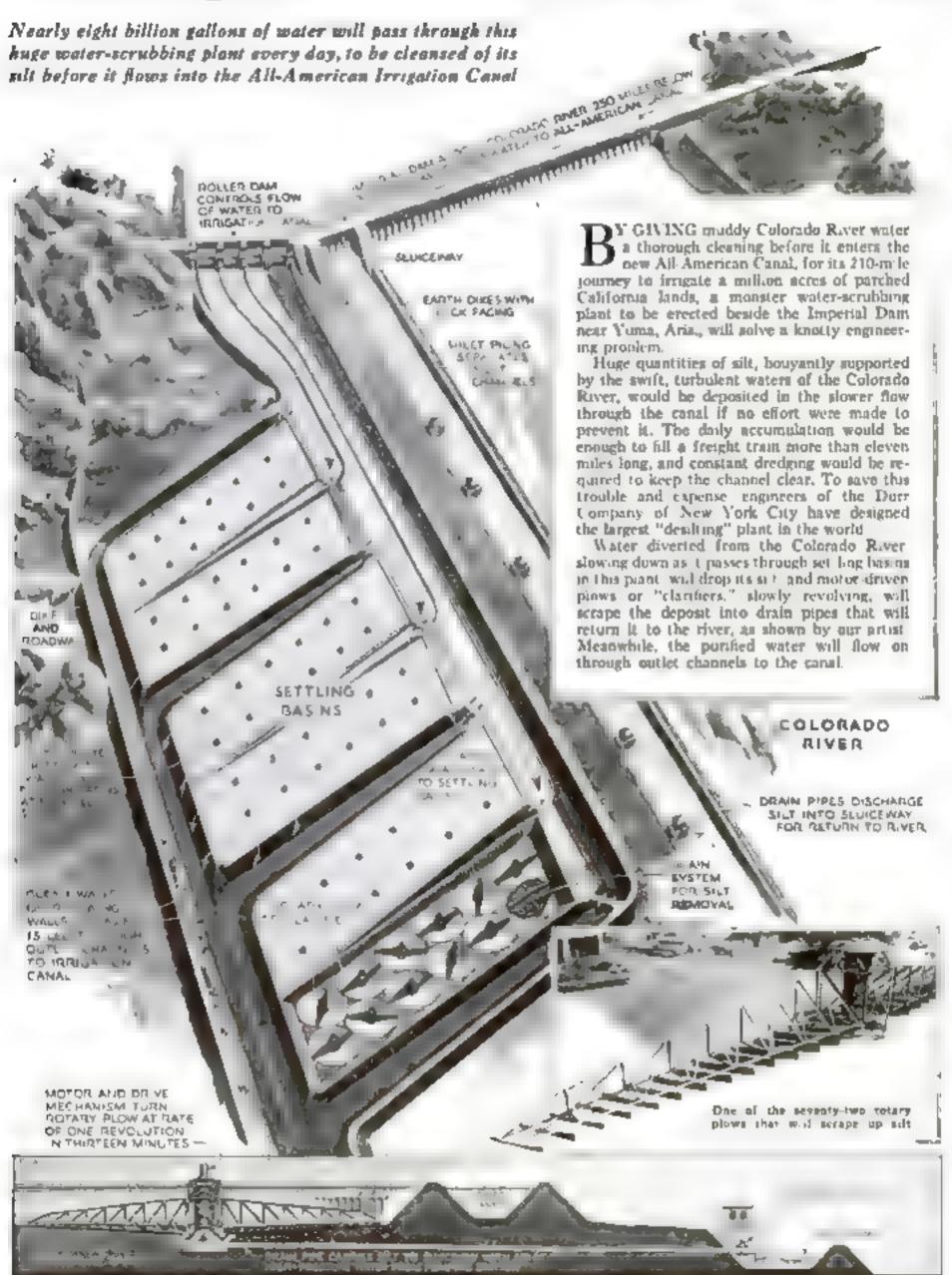
Four pictures of the same sky area showing how langer exposures, at right, reveal faint stors



Dr. Hubble manipulating the electric controls that teep the telescope trained upon a war

Penetrating farther into space than any celestial explorer has gone before, Dr. Edwin P. Hubble of the Mt. Wilson Observatory in California, recently secured the longest-range photograph ever made. Although unimpressive in appearance to a layman, it shows an unnamed "star city" or cluster, nearly sixteen quadrillion miles distant from the earth-a distance so staggering that the rays of light that reached his camera started toward the earth a half billion years ago, Throughout the exposure of three and a half hours, a delicate clockwork mechanism synchronized with the rotation of the earth kept the giant 100-inch telescope trained approximately upon the center of the star group. Even greater precision was required, however so Dr. Hubble sat before the sighting evepiece, constantly regulating electrical controls that kept the image of a star centered. upon a pair of illuminated cross hatrs.

Washing the Muddy Colorado River



VOVEMBER, 1935



INE times, a movie stont man plunged into the awirling rapids of a Washington river swim ming forty-five minutes in water twenty degrees below the freezing point. In Southern California, another de molished nine new automobiles in spectacular crashes within a week. A third memoer of this strange featernity jumped an untrained farm horse sixty feet into a pool of water, three others walked leisurely in asbestos suits through seven gallons of flaming on, scattered over a steep stair way. Still another pailed the pin to unloose the tongue of an old-fashioned westerts tragecoach and prunged down a mounfain canyon in the runaway vehicle

Every day, somewhere on location or within the walts of a Hollywood sound stage dare-dev is who follow the world's most bizarre and dangerous occupation tempt fate with their courageous feats. Although hundreds of young men offer their services to the studios, willing to undertake the widest sunt that any director may conceive seven in 1-1 mers —veterans in their middle thirties—perform nine-tenths of all the hair raising

They "double" for farous actors and actresses whenever the stars' safety is threatened. In Hollywood there are, too, a number of "bump men," athletes who undertake less hazardous swims, fights, falls, and tides. But when any of these "doubles" decimes some job which means death if he misses, the casting director calls for one of the veteran stant men

These seven are a small remnant of the scores of stunt men who have come and gone with the years, 130 of whom have met death during the performance of a ficult stants for the screen

Their names—Duke Green, Bob Rose Gordon Carveth, Cliff Lyons, Yackima Canutt Frank Clark and Matt Gilman—

By John E. Lodge

you never see on the screen. They appear on a set for a day or two thrill actors and technicians with their daring and move on to another job. frequently without knowing even the name of the picture they have helped to make

Yet, the veterans in the game have evolved a science by which they face serious injury, or perhaps death a bunfired times a year. I'ming and nerve" is the formula a stunt man will offer for his freedom from horts. He applies principles as exact as is possible to make sure be will emerge unscathed from a four-story fall an underwater struggle with a man-eating shark or a plunge off a trestle in a locomotive

Yet the best-laid plans skill, and experience do not always save a performer from tojury. For instance consider Gordon Carveth's experience when he answered a cal to make a scene at a beet-

In the photograph he ow a movie stun, than th sear wear no the initial ad thinker au I which he concented when the concented when the concented when the concented when the concenter on a switching for projection of may two wave degrees above acry



AN UNINTENTIONAL THRILL

The untrained farm horse used in this spectace ar cup did not do easily who was expected of him. As a result, the date devisider was caught beneath the somernaulting an mal as it scruck the water. He suffered a appared back, but the horse was unin, used





sugar factory in Chino, Calif., recently

The director sed him up to the fourth floor. "See that open well behind the fence?" he said. "You fight on this side you take a punch in the jaw and drop hackward through the fence. Cameras will catch you faling past each floor, and the net will break your fall below—I hope."

It happened the property man had forgotten to bring along the breakaway fencing made of fraghe bassa wood or desert yucca, so Carveth ordered a carpenter to cut the regular fence in four places. The tight began. Carveth and a professional boxer pounded each other, the pair moving gradually toward the well. When Caryeth reached the fence, the boxer struck Carveth on the chin carrying the punch through to give him added momentum

The fence gave way like paper and the stent man rolled houself up for the fair his knees and hips beach as he had planned the momentum caused him to strike the net fert-first, the force of the blow driving his left knee against his forchead. Within a few numbers a bump the size of an egg rose on his head but the make-up man "erased" the bump with appropriat shades of grease point and Carveth it leaved the fair twice before the factory whistle blew at non-

It was Bot Rose a wiry lit le man of .25 pounds, who faced the man-eating shark. He arrived at the studio not long ago, to see property men holding the shark

in a portable tank while a muzzle was tied over his mouth. The shark then was dropped into a larger tank into which the camera peered through a plate-glass window. Five minutes later, the strange battle commenced.

Never have I experienced a more weird sensation." Rose fold me. "I felt sure I could rely on my hands and the clear water for protection, but the creature gave one everything he had in the first round. He tried to ram me with his nose, while I could see his jaws moving in a frantic effort to open. His tail swished every time I dodged, and threatened to knock me through the side. After a half min.



R har as

are te. Buledes began
to fall the water. While
this gave a time camera
ficet at clouded the
water so I could hardly see. When I ducked
after my fourth trip
up, I saw that his muzzle had slipped. No
mure time for pictures
then' I grabbed the
ladder and pulled myself over the edge of
that tank quicker than
a cat cloubs a tree."

Although a slip would have ended Rose's career at that instant he considers the plungerate a river in a locomotive actually more dangerous. An ancient toal burner had been rebuilt to duplicate a modern Golath of the rail. A bridge had

would prange to their words as would prange to their with Dressed as a woman's continues. So took his piece in the cab opened he throttle and toated down the ralk When he reached the bringe, the enginestarted to crash down though the wooden it are and Rose toxed through the wooden it are and Rose toxed through the calculation in the running war or fitty feet show. Timed to a split second his stant carned for him \$750, and required no nore than thirry seconds to complete

Dake Green has braved the cord waters of many streams in perdous swims, hat his nine plunges into the north fock of the Nooksack in four days provided one of the toughest experiences ever tacked by any stant man. Although he was procited from nock to knees by an offste rubber suit, intended to give him busy ancy, he lost fifteen pounds during the ordeal of remaining for a total of the five minutes in the stream his clothing frote on his back three fingers on each band were freight as stiff as boards and he could not breathe normally for two hours after each plunge into the river

Cold water takes more out of a manhab any other monon-picture stant, ' he is I me. 'Three doctors and two rappers worked on me every time I came out. I set my hearing and couldn't uncerstance shout. For hours, I felt as though I was standing under a freezing shower. When dond began to return to my fingers, which had turned blue from the intense co.d. I did not know whether to holler, stand ap and obeer or knt my teeth and bear !!

Despite the skill required and the powoften endured, stant men as a rule anune y and. Many risk their lives for as



How Railroad Men Talk with Their Hands



To find cate a caboose the switchman bends his a m inward to his budy and presents to accatch his some The aignoling a ratic of he days when the caboose was not as a ran a piece as it is today

TO SPEED the work of breaking up long freight trains and redistributing the cars on the mase of tracks in a big terminal, railroad men have evolved a sign language of their own. By the use of picturesque signals, yard foremen switchmen, and yard enginemen can communicate rapidly and accurately. You have probably seen some of these signals in use, and wondered what they meant. The illustrations on this page show some of the common signals used by railroad men.





One of the most pictoreaque a gnale in the cariroad sign anguage is the one that stands for a grock car. The switchman places his opened hands, thumbs in at the aids of his bead in imitation of the cars of an animal



When a car is to be "epotical," or placed in some definite pears on for loading or uninading the fact to conveyed so shown. This eignal may also mean that it is "Time to est"



The main ine track is indicated by the signal illustrated above Every track has its designation



Raising his hands over his head to furm a gable the awatchman signals a ter to the house track



To send a car to the ce track, the switchman covers his care as if to protect them from the cald



Even a laying of translate this graph t persure as telling the engineer to Q ve em a shove"





Each track number has its appropriate a goal, by which it can be indicated we hour fear of mistake. At the left is the sign for number laws. Ten. at right, is derived from the Ramon numbers?



This eighal meaning "Full up to here directs the engineman to push the care to the limit of the track





An Italian tank taking a burdle in an obstacle race at Rume. Difficult barriers were surmounted at high speed

Fast, Powerful Land Battleships
May Speed Up the Next War by
Preventing Trench Stalemates, or
Even Make War an Impossibility

By

THOMAS M. JOHNSON

PEACEMAKERS OR WAR BRUTES

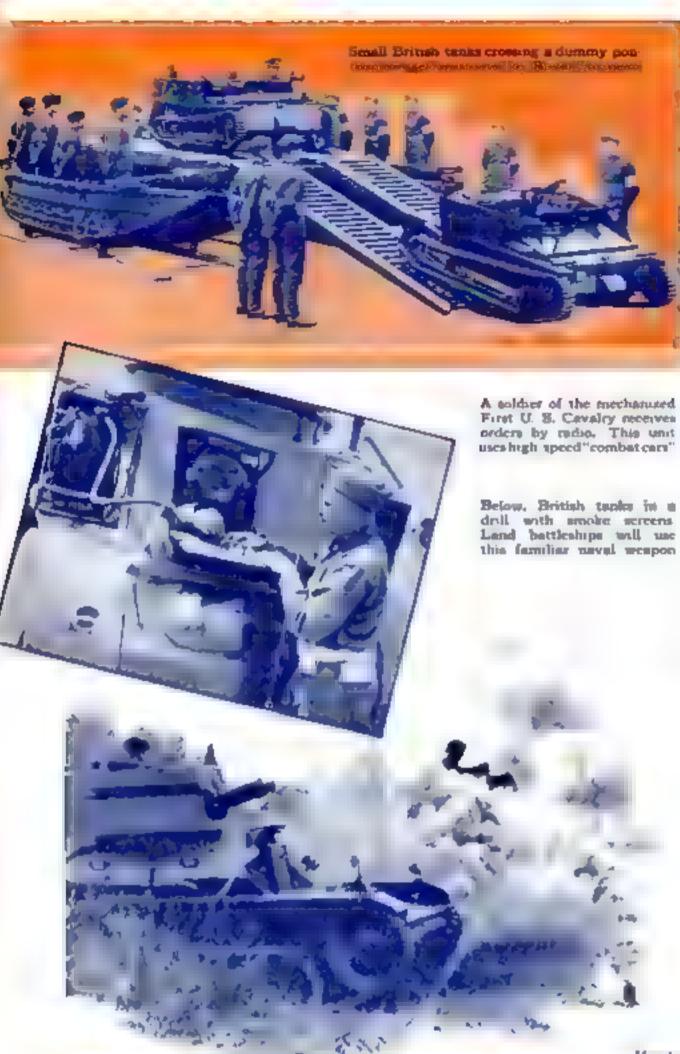
ARS has put on overalls. In carefully guarded machine shops, laboratories, and foundness all over the civilized world the war god is tinkering with strange new machines, grimly determined to solve the mystery of that "next

war" which the world dreads, but in preparation for which it spent last year nearly ten billion dollars.

The solution of that mystery, in the opinion of many experts, may end the world's dread by making an end of war itself. Is it too much to hope that invention which in the past has merely served to multiply the instruments of death, may once more change history—this time in the role of a peacemaker? The answer may be in the latest and most terrible of the descendants of the war chariot, the land battleship.

In the seventeen years that have passed since the end of the World War, military authorities have been concentrating their attention on that monstrous war haby, the tank. New inventions and improvements have greatly increased its effectiveness. The year 1935 is seeing the greatest development of this new arbiter of the battlefield since it first appeared upon the shell-torn fields of France in September, 1916.

Then, its dramatic entrance, its mystery, astonished the world. It, and its immediate successors, helped to break the bloody trench-warfare deadlock that had prolonged the world's most terrible war. But, once the shock of surprise wore off, World War tanks proved by no means invulnerable. They were awkward and slow, crawling on tractor treads at three or four miles an bour They constantly stailed, from engine troubse. What a mark



they presented for the enemy artillery!

Today, tanks go ten times as fast on roads, using wheels. Striking rough ground, they instantly switch to treads by dropping a ten-pound drop-forged steel rack on each side, over the wheels. With these, they can go five to ten times as fast as the World War types, crossing shell holes, ditches, and trenches.

Experimental-model tanks currying three-inch cannon have sped 120 miles an hour, jumped thirty-five-foot gaps, and forded streams under their own power J Walter Christic the American tank inventor and former automobile racer has raced a tank against standard automobiles.

la nineteen years of research, engine designers, fuel and oil engineers, and metallurgists have made an engine lighter per horsepower, yet much more powerful, than World War tank engines. The first tank had two Daimler vertical-sleeve-valve six-cylinder, 150-horsepower water-cooled gas-oline engines. It was a poor chimaer, and could not sport. These engines gave up to 5.7 horsepower per top of tank weigh. Today, one of the new Christies, with a Liberty engine, gives thirty horsepower per top and has great reserve power

Modern tank engines attain maximum power output at 2 000 revulutions a minute. They are usually Diesels, horizontally opposed, air-coated and can operate in dust. The tanks run on new-type tracks that can stand the new high spreads for 2.000 miles before they need servicing. That is due to new hard-rubber plates, improvements in steel, and heat treatment

Such speed demons may change wariare. In 1918, the tank's greatest danger
was a direct hit by a shell from a cannon
especially a swivel cannon devised to fire
against tanks. These scored many hits on
the slow-moving Allied tanks. But today
the new tanks go so fast and dodge so
nimbly that it will take a remarkable cannon and a remarkable cannoneer in hi
them. Can they be kept from getting close
up to the trenches in which crouch the
devoted infantry?

Straining their eyes against the amoke and gas of battle, the doughboys usually can see no farther than 1 000 yards in o no man's land. Fast, modern tanks can dash that distance in at most, two mirrates. Not much time for infantry with rifles and machine guns to make a stand before the steel monsters crush them into the mid of their trenches.

That is why Chancellor Hitler an-

Hundreds of Russian tanks assembled for a parade



nounced, no longer ago than May 27, 1935. that Germany will be armed with two fast tanks and motor vehicles to every four soldiers.

That is why, at recent Itanian Army maneuvers, after Premier Mussoum had seen the remarkable performances of the new Dubian tanks, he cried enthusiastically

"The tanks have made trench warfare obsolete!

Many military experts agree with him They say that the great improvements in tanks, armored cars, and mistary motor vehicles of all kinds that are materializing today, will certainly change war greatly They may even end the next war almost as soon as it begins, with a terrible spinning, whiszing awoop of armies on wheels and caterpular treads, traveling at undreamed speed hundreds of miles a day upsetting al. the precedents of strategy ripping through hast ly dug trenches, eluding arti lery five. Like a swift rapier, this mechanised force will cut through to the enemy a directing nerve centers, his head quarters, his bases. Those destroyed, he is beaten. The war is ended in days or weeks-not weary years-at small cost in Lyes and maney

Hut suppose, somehow, even these supertanks cannot get through to a vitaspot on land. Then, the land battleships will take to the air! Airplanes fitted beneath with a sort of torup, will pick up the tanks. Through the air they will energy them, to poin a above enemy headquarters.

Deposited on the ground, the tanks and their specially trained crews will act with accuracy impossible to aircraft. Over the headquarters telephone and radio, they will send to the enemy units, false, confusing orders. Then they will smash switch boards and transmitters, cut wires, and at last, laden with valuable beadquarters papers and prisoners, signal for their own planes to pick them up again, and wing borneword.

Only by tanks chuld such a plow be dealt. In Russis, experiments have already shown that a tank can be dropped by parachute from the our J. Walter Christie expects soon to demonstrate flying tanks. He has been experimenting for years with a tank with wings that come off when it lands, and with a plane with books underneath that pack up a tank

The next war will not only see tanks that fiv but tanks that swim. Christie has an amphibious tank that has recum the Hudson R ver near New York. Great Britain also is developing a swimming

tank. This remarkable land-and-water fighting craft weighs two and a half tons, is six feet ten inches wide, six feet high, and thirteen feet long. It can speed forty miles an hour on roads, but has a flat. scowlike bottom that enables it to slide easily into the water. Driven by a propeller. at the rear and steered by a rudder the odd craft pushes into the stream at six miles an hour against wind and current Like a submerged hippopotamus, it shows only its head-the round turret holding a machine gun which is fired by a gunner sitzing beside the driver-palot

When he wants to come ashore the driv er starts his caterpillar treads, and through shallow water they help the tank wade out, boosted by the propeller. Instantly the tank dashes off at its thatmum speed of forty miles an hour and can turn around and plunge back into water again, without making adjustments. A formidable weapon to is unch from ships, to make a landing on an invaded sea coast—or to defend such a coast"

Britain has blazed a trail in mechanization of her army. She has developed not only the famous Carden-Lloyd and Vickers types, but tracked machine-gun carriers and trailers, which are used in Canada also; tanks especially devised for making smoke screens, and for fighting

savages. Half the British artificely is motorized, and even the cavairy dashes about in baby scout cars. Britain has 500 new tanks, and recently sent an officer to prison for five years for selling photographs of them to spies of a foreign power

If the British bedeve to swimming tanks, so do the Russians, Russia has bought a bundred of Christie's American tanks, and on last May Day, seventy-five of the amphibians paraded in the Red Square of Moscow. They were part of one parade which was only one of many all over Russia, in these parades appeared to one day, 2 730 tanks of all shapes and sizes. In Siberia are at least 500 more In the last four years Russia has increased her tank strength by 800 percent, and









This Verezue an armored car appears to have taken a cue from the native armadilli-In spite of its heavy aimor, it can attain a high speed over fairly rough terrain

he speed of her tanks three to six times. Russia has more models than any other country, including "tankettes" and land bactleships carrying heavy cannon. Eight of these paraded in Moscow in the May

Day parade

France claims one of the largest tanks in the world. This monster is thirty feet high, twelve feet long and nine feet wide It is driven by a 600-horsepower motor It carries a seventy-five-millimeter cannon four machine guns, and a crew of twelve men. France has 3,000 tanks, more than any other nation in the world, However, all but a few hundred are World War models, almost useless except agains) African tribesmen. But the new Renault and Schneider models have heavy armor and forty percent of French artiflery and practically all the cavalry are motorized. France has had less success with amphibun tanks, and cannot develop un engine that will run after fifteen minutes in the water

ITALY worries less about tanks that swim, than sooul tanks that climb, for her wars would be fought on her mountainous frontiers. Recent tests showed that the new Fint can negotiate all sorts of steep ground, rocks, even slight precipices, it can practically stand on its head. then recover, and go on. These are some of the performances that pleased Mussoani. His army has also developed a new one-ton "auto caretta" only four feet wide with a three out tread, that can carry almost any weapon or munitions anywhere

A great enthusiast for mechanization is Japan. The Japanese make their own tank, the Osaka, and are experimenting in directing at by radio, without a crew, to explode in the enemy's trenches ike a land torpedo. Last winter, they tried this out on the ice of Lake Suws. Though Japan has only a few hundred tanks, a great many of them are of modern types But together with her enthusiasm goes a certain caution, and the Japanese is the only army that has special motorized units trained in antitank fighting.

It is not only the great powers that are

nterested in this newest form of war mak one. Bolivia bought British tanks to use in the jungles of the Chaco against Paraguay. Persia has a Christic tank. Peace ful Swatzerland has more modern tanks per thousand soldiers than any other mation in the world-5 3. Then comes Poland, then Lathuania.

The dread newcomer on the tank battlefield is Germany, who but yesterday had no tanks at all. The Treaty of Versailes forbade her to have them, so she made dummies with which her soldiers drilled. Now, Germany has announced that she is building thousands of tanks, armored cars, and other motor vehicles And it is said that she has secret plans prepared, in event of war, to turn nearly all her farm tractors into tanks in three

We might have to do something like that if war should come to the United States today. This threatening year of 1935 finds our Army practically steepped of tanks. Today, we have in commission just twelve tanks of modern design, and many of those are experimental models This spring, the Army quetly put into

more than a thousand, including all the models assued to the National Guard. These were all World War models; in taking them out of commission the Army was obeying a new law that makes obsolete every Government motor vehicle built before 1920

Our War Department has been experimenting with new models, and only recently has it really been getting anywhere Gen. Dougeas MacArthur, Chief of Staff of the Army, explains the situation thus

"By devoting every available dolar toward the development of a satisfactory experimental model we have finally produced single units of real promue. The fatest types are capable of a mistained speed of some forty miles an bour on roads, and some twenty miles an hour across country, except on the most difficult terrain. These advances have been accompanied by equally significant ones in the reliability of the machine, and in the effectiveness and power of its armament "

How many such tanks have we? Today, only one. Some time pest year we may have sixty-four really modern and efficient tunics and "corsbat cars," as the Cavairy call their own special brand of tanks and armored cars. "Then, and not until then," says General MacArthur, "a real beginning can be made toward the development of modern lactical doctrine as applied to them,"

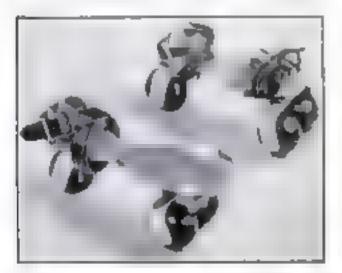
THERE was a hint what this "tactical doctrine" might be, recently, on the hutoric Revolutionary battleground of Yorklown, Va. There three tanks aped across country at twenty-two miles an hour. After them rumbled, on tractor treads, a seventy-five-millimeter cannun, self-propolted, ready to fire instantly. After this cunnon came six-wheeled trucks, mounting muchine guns. Into a wood they dashed following the tanks, which crushed down underbrush and trees to make a path for

Our First Cavalry has turned its horsemen into mechanics, testing out new armoved cars which it fler from tanks in that they have wheels only, not treads, and so cannot readily (Continued on page 114)



MUFFLER AT TARGET RANGE TRAPS NOISE OF GUNS

Republicand the abarp crack of firearms to a dall thump like the sound of pounding on a heavy hux, a new target-range muffler makes justal and rifle practice easter on the ears of the participants and of others in the vicinity. The user fires through a chamber, open at each end, as shown in the cut-away view above. A sound-absorbing lining of balsam wool covered with perforated metal, shown in the inset, traps the noise. According to the maker the muffler offers no bands cap to marksmarship. By come nating the grate on the front sight, it permiss the range to be adequately lighted. Two sizes are available the smaller one suited to small-calmer pistols and r fles in basement ranges or those of small clubs and the larger model to gons of any camber



MOVIE SHOWS CONQUEST OF THE AIR



Octa Littersthal's unsuccessful attempt to fly with flapping wings, as recoacted for movie

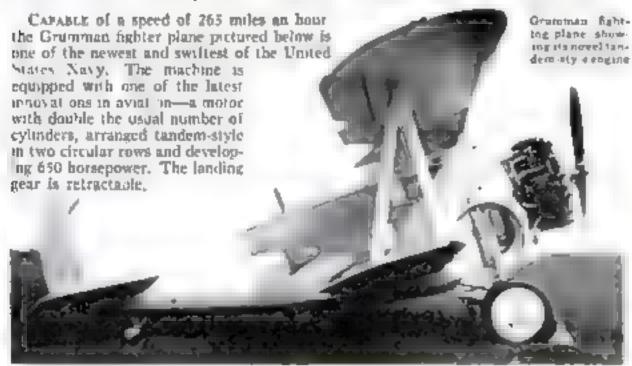
STREETS episodes in the history of than a conquest of the air are being reenacted for a movie in England. The odd acene reproduced above shows the filming of one of the earliest and least known experiments of title Laurethal German pioneer. Seeking to fly by flapping wings be built this curious machine in 1868, and tested its lifting power

by banging it and a counterweight from a boom attached to a barn. The experiment was a failure, since he found that by the utmost exertion be could lift only balf his weight. Turning aside from the flappingwing idea, he devoted himself to the historic gliding experiments for which he is famous, and which belied pave the way for the eventual success of heavier-than-att machines.

THREE-WHEELED SKATES HAVE RUBBER TREADS

Rubber-corresponds of fiber replace steel wheels in roller skates of new design. The three-wheeled skates are said not to mar floors or carpets, and to be virtually silent. According to the maker they require no hibrication, and are lighter in weight than ordinary steel skates. The illustration shows the standard size and also a smaller model, with front wheels set well forward to prevent overbarancing intended for the use of very young children

ODD MOTOR POWERS FAST NAVY PLANE





INGENIOUS LOCK BALKS PILFERING OF OARS

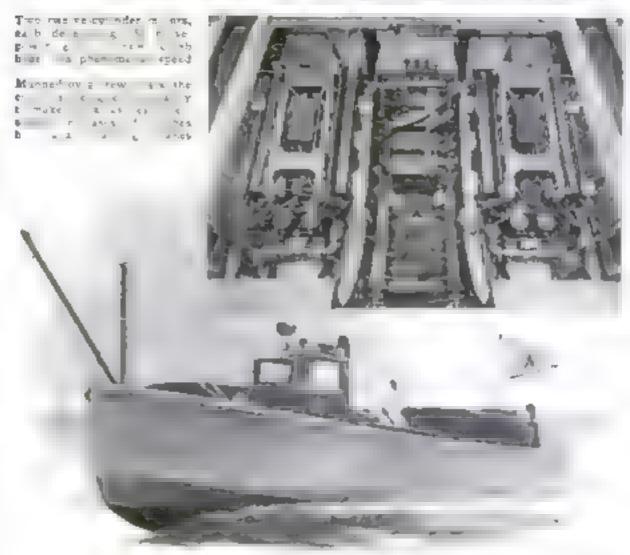
OARS cannot be taken away without the owner's permission, when they are protected with a lock that has been devised by a California inventor. A pivoted cross member attached to a brass yoke swings aside so that the oars may be inserted. When the cross member is turned back and made fast with a padiock, the oars are secured against unauthorized use. The device may be securely boited to a wharf, a boathouse, or the stem of a rowboat, as a lustrated in the picture above.



HAIRLESS MICE MAY GIVE CLEW TO BALDNESS CURE

Just arrived in this country, a shipment of African "rhinoceros mice" may belp scientists to find the gause of baldness and develop a cure. Although the strange rodents have whiskers like other mice, their bodies are devoid of bair Experiments to determine the cause of this unusual characteristic are planned by De-Alexis Carrel of the Rockefeller Institute and Dr. W E. Cassell of Harvard University. If the experimenters should succeed in growing hair on the mice, as reports indicate they may attempt, it is hoped that a similar treatment may be worked out which will cure basiness in human beings. Two of the mice are seen in the picture above,

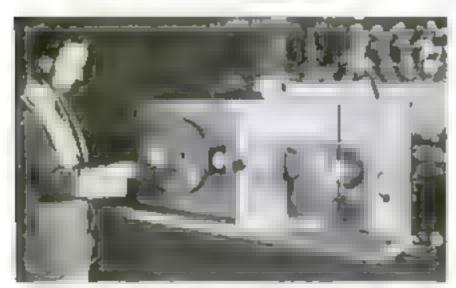
FAST BOAT SPEEDS AIR-CRASH RESCUES



Declared the fastest craft in the service, a fifty-mile-an-hour "crash boat" is under trial by the U.S. Navy. Its mission is to speed to a training plane that has crashed into the sea, rescuing the men and

salvaging the plane if possible. Two twelve-cylinder motors developing 650 horsepower apiece drive the forty-five-foot racer, and six men, including a doctor and assistant, constitute the crew

CAMERA SHOWS ARC IS HOTTER THAN SUN



New camera which measures are's best by photograph og sound wave

FIRST accurate measutements of electric-arc temperatures show that carbon arcs used in lighting exceed the sun's surface temperature of 9,000 degrees F., and some welding area reach 13,000 degrees. Applying the fact that sound travels faster through a bot gas than a cool one, General Electric engineers used a special camera to time the pasrage of a sound wave set up by a loud spark through the arc

COMPRESSED AIR REPLACES DYNAMITE FOR MINING

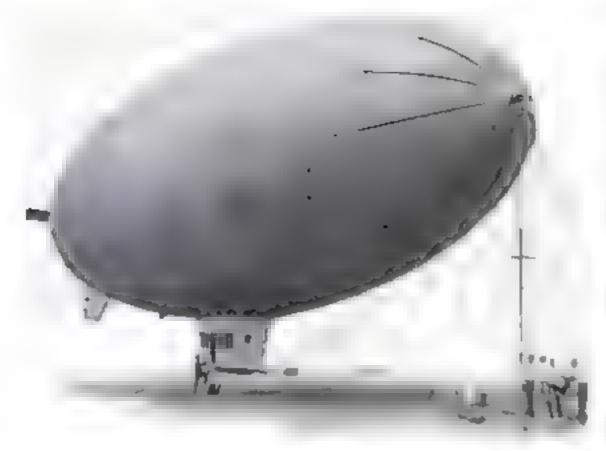
Contents in a new method of coal mining, through which dangerous fumes are eliminated and the coal is recovered in larger and more valuable chunks than heretofore. A long steel cartridge is thrust into a drill hole in the face of the coal deposit, as at right, and is charged with air to a pressure of 15,000 pounds to the square inch. When the miners have retreated to a safe distance, a valve suddenly releases the charge. Expanding, the air beaves out the coal in large fragments, without shattering it. The cartridges may be used over and over again.





ROOMY TELEPHONE BOOTH HAS NOVEL APPOINTMENTS

Accustomen to the cramped quarters of an ordinary telephone booth, an American would be taken aback at the roominess and appointments of a new style of booth introduced in London, England Patrons may avail themselves of a luggage shelf, a mirror, an umbrella stand, and a tigarette tray, while large signs give telephone rates and explain the intricacles of dialing for the benefit of the unmittated,



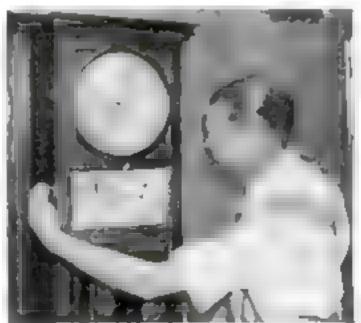
DUMMY AIRSHIP TESTS NEW MOORING METHODS

BUILT from discarded parts of other atribips, a motorless bamp that was never intended to fly is belying engineers at Akron Ohio, to solve mooring problems of ligh er-thon-mr craft. The photograph

above shows the helium-filled bag during a test of a new type of mast. Stresses are measured with instruments attached to guy cables. Other dia's revore weather duta

CLOCK KEEPS MORE ACCURATE TIME THAN THE EARTH

A crock that keeps better time than the earth itself is a mechanical marvel soon to be installed at the Greenwich Observatory in England Asteonomers gauge time by the speed of the earth a rotation, as shown by the passage of stars across the sky, but this varies slightly. In a year's time the earth may be a full second "fast" or "slow." The new clock will not gain or lose more than a quarter of a second yearly, permitting a check on the earth as a timekeeper

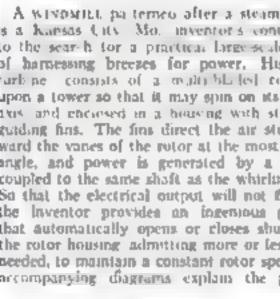


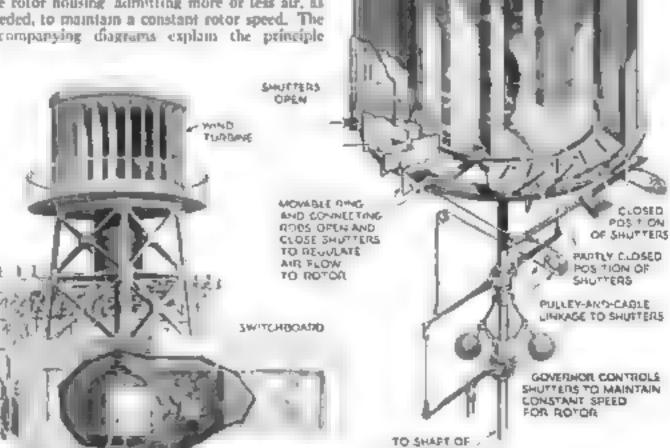
One of two clocks to be two by new need ston temporate

WINDMILL OPERATES LIKE A TURBINE

A wivowith pa terreo after a steam furbine is a Kansas Lity. Mo. inventor's contribution to the sear-h for a practical large scale means of harnessing breezes for power. His "wind turb ne consists of a multi-bladed cotor set upon a tower so that it may spin on its vertical axis and enclosed in a housing with stationary guiding fins. The fins direct the air stream toward the vanes of the rotor at the most efficient angle, and power is generated by a dynamo coupled to the same shaft as the whirling rotor So that the electrical output will not fluctuate, the inventor provides an ingenious governor that automatically opens or closes shutters on the rotor housing admitting more or less air, as needed, to maintain a constant rotor speed. The accompanying diagrams explain the principle

of the wind turinne and show how it would appear from the externer when installed in connection with a plant for the general igof electric nuwer





The wind turbine as it would appear installed and, right a view of the turbine details

GENERATOR



SPARK PLUG KILLS CAR RADIO NOISES

SPARK plugs of a new type for cars equipped with radio, are designed to suppress annoying interference caused by the ignition system. Each plug contains a resistor built into the insulator which is said to reduce clicks and other noises to a minimum. The photograph above shows one of the new plaga cut away to reveal its construction, the resistor, in dicated by the pencil, is readily removable and may be replaced whenever necessary without buying a new plug

ODD USE FOR GOLD

COMPLICATED apparatus used in certain chemical manufacturing processes is made throughout of fine gold. The costly metal is used because of its resistance to attack by acids and other strong chemicals

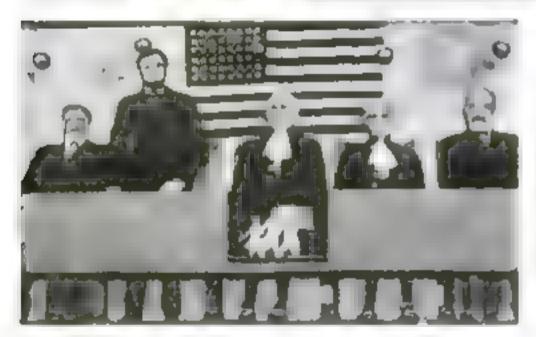
FLYERS PHOTOGRAPH FAIR BY NIGHT



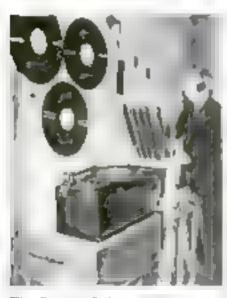
TINY RADIO BUILT IN CIGARETTE CASE

A RADIO built into a rigarette case was a novelty exhibited at a recent British radio exposition. The miniature receiver employs a rangle lube -one of the sma lest in the worldand has a pair of midget tuning dials. Only half the thickness of the case is occupied by the set, ample room remaining for about a duzen cagarettes. The radio is turned on or off by means of a knob at the outer edge of the case, which is shown open in he accompanying photograph to reveal the compact units of the midget receiver





PAST PRESIDENTS "TALK" IN EXHIBIT

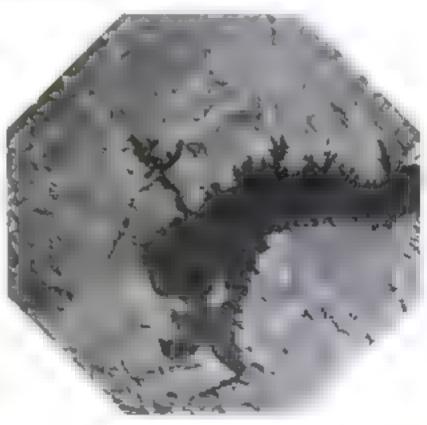


The figures of the presidents, upper view are moved by back-stage levers

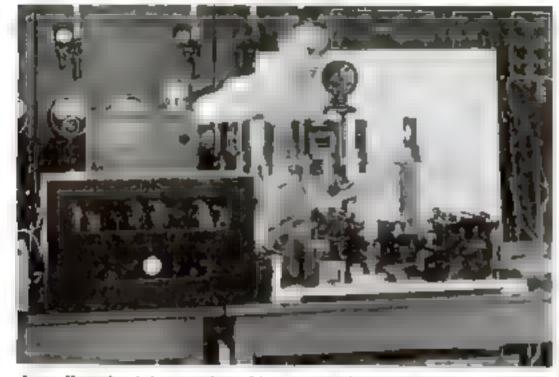
Five of our most famous presidents come to life in a unique historical exhibit designed by a New York inventor for display in stores and schools. I nder the control of an operator offstage, figures representing Theodore Roosevelt, Abraham Lincoln, George Washington, Thomas Jefferson, and Grover Cleveland rise in turn and deliver excernts from some of their most famous speeches. Levers like those in a signal tower raise and seat the figares and the voices are supplied by sixteen-inch phonograph records and reproduced by loudspeakers hidden behind the stage. Dummy micro-phones give the exhibit a modern touch. suggesting that these former chief executives might have assembled to take and phonograph records talkfor them part in a present-day meeting

GREAT WEIGHT OF BOULDER DAM MAY DEN'T EARTH'S CRUST

Like a stepped-upon air mattress, the surface of the earth will be poshed in by the weight of Boulder Dam and the Columdo River waters it impounds, if the view of the earth as a thin, flexible crust floating upon a plastic interior mass is correct. Tests of the theory are made possible, for the first time, by the unprecedented magn tude of this concentrated load, the weight of the like alone being estimated as 41,500,000,000 tons. Beneath this burden according to the theorists, an area of 150 square miles should sag as much as two feet. Surveyors' beach marks will be used by Gov-ernment scientists to determine if this is so. The remarkable air view below shows the vast extent of the lake impounded by the dam.



Amateur Transmits Sound on Light Rays



Juntar Roward and the transmitter of his apparatus for sending sound over light rays

COMPRESSED AIR RAISES PAINTER'S SCAFFOLD

By MANIPULATING air valves of a new pneumatic safety stage, a painter may roll the platform on which he stands up and down the side of a building. Rubbertired which prevent marring the walls. The telescopic supporting column is extended or lowered by air pressure, supplied either from atorage tanks or from a portable air compressor, and may be moved sideways along the wall on a second pair of wheels at its base. Use of the new itevice is said to save time by eliminating the trouble of adjusting ropes, as with a hanging patiorn.



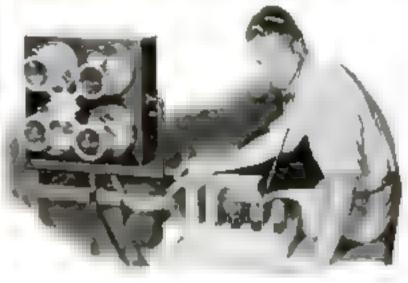
This new scaffold is caused or lowered on a telescopic column operated by compressed air

Four lenses, in receiver at right co lect the light cays and focus them on four photo execut a ce la which convert them into execut a limpulses for tound suproduction





PARALLELING experiments of professional research workers, Junior Howard, twenty-one-yearold graduate engineering student of Kansas State College, has built apparatus of his own design to transmit speech and music on a ray of light. The beam of an arc lamp, modulated by a Kerr cell and potanzing prisms is picked up by electric eyes at the receiving end and the sounds are reproduced in a loudspeaker, or in headphones. Hiding the receiver in a professor's home, a quarter-mile distant, Howard surprised him with an unexperted musical program.



ERASURE GUARD ENDS CARBON-COPY BLURS

HANDY for typists, a new erasing shield facilitates currecting errors without smudging a carbon copy. When its metal tongue is shipped between a letter and a carbon sheet and an aperture plate is shid into position on a frame above the letter a nest erasure is easily made. The device may be applied from either side of the paper and apertures of assorted sizes permit one or more crasures to be made at a time. The accompanying photograph shows the shield in position and the manner in which it is used

PROPELLER MOVES AIRSHIP VERTICALLY

A FOUR-BLADED propeller mounted beneath the gondola of a new French dirigible enables it to maneuver vertically like a belicopter ascending without deopping ballast and coming down without valving

gas. Forward propolsion at speeds up to fifty rules an hour, is provided by a second, conventional propeller. The two air screws have individual power plants of fifteen and sixty horsepower respectively



No Place Like Home

...TO GET HURT



OU face 266 times the danger of injury while reading a book at home, walking down the cellar stairs, or thawing a frozen pipe. That your neighbor does when he embarks on the evening plane for a distant city. Unbelievable? At the risk of horing you,

Unbelievable? At the risk of horing you, I shall prove my statement with a few

figures

This year, if the nation's experience of former years holds true, fully \$ 184.500 of our 125.000,000 men, women, and children will suffer accidents—from falling out of chairs to slipping down sey stairs—in heir homes. Of the \$61.3.0 or more passengers riding to transport airpianes, for a total distance of 49,000,000 miles, not more than 357 will be involved in seventy-three accidents, and only eighty-eight will receive so much as a scratch

One in twenty-four will be hurt at home, whereas only one in 6,378 will meet

an accident on an airbner'

Suppose, however, your neighbor roars away from the neighborhood airport with a barnstorming pilot or a friend who files for fun, Will be come home whole or in pieces? The surpresing number of 1,397,-288 passengers flew 75,602 152 miles in private pianes last year and only 2.711 were involved in 1.549 accidents. Of these a mere handful—1.56—were burt Half this small total sustained bruses only. So, if you decide to try your wings with a friendly pilot in your fown, you has seventy-four times safer than at home

Queer accidents, usually under circumstances that promise safety to the victims, strike down people everywhere. Serious at the moment, many of these strange uscidents which, despite the intervention of science and education, increase in numbers every year, bring thuckles when viewed from the apparent sale, y of your own arm chair,

Let's skim around the country for a close up view of some of the oddest. In the Northwest a truck driver, arriving home after a dangerous day piloting his machine over streets deep in snow tried to open a window swulen tight. When, after several efforts, the window flew up, the man led off balance and dived three stones into a bank of snow. A housewite in trary Ind., slipped on a cake of soap while bathing incocheted through a window and plunged three stones into a jule

of sand, receiving only rminor bruises to aftest her unusual experience Not to be outdone by this feat. Mrs. Evelyn Stewart jost her balance and fell five stores from the balcony of her New York apartmentonly to and in snow piled bigh along the curb. Little Booby Isbet of Morrist le N 3 cetebrating his third birthday by playing with a new knife fed out of his chair The three-inch blade penetrated his skull above one eye to the hilt, yet the youngster recovered.

While painting an elevator shaft, James Parnell, an aged Brooklyn, N. Y., workman, tumbled from a ladder, clutched a starting

cable and was puned between car and wall for mneteen hours before Charles Somerville "had a hunch" something was wrong anside the building and went to his rescue. A few days later, Arthur Thomkin, a youth living in the same neighborhood, slid down a dombwaiter rope to save walking down four fights of stairs. The rope parted and dropped him onto the basement floor; he broke both legs and fractured his skall. Possibly he would have met a worse fate had he walked. One man, ascending a flight of iron stairs, fell when a step broke and banged himse firom the skeletonlike superstructure.

Every week, miraculous hair-breadth escapes from death are recorded. A Kansas farmer was knocked out of his chair on his feont porch when a speeding car flipped a rock against the side of his head. In Los Angeles, Calif., a youth lighted a cigarette while trying to take himself out of this world with gas, and the resulting explosion saved his life by blowing him out through a wall. An eleven-year-old boy, warned to avoid traffic with his breycle, chose to ride the vehicle on the roof of an apartment house. He rode off the edge and landed in a police-station yard forty feet below, suffering only a bruised thumb.

Not all escape so luckely. Often, ample mistakes end in death. When basement water pipes froze on a cold winter night, a sixty-year-old retired builder whose life had been spent constructing houses, applied a gasoline blowtorch to the problem. But the supposed water pipes led to his gas stove—and the resulting explosion ended his life.

You never know whose carelessness will endanger your bousehold. One of forty-

eight youngsters living in a Charlotte, N. C., home for children machievously turned on the gas in the kitchen. A pet parrot perched near the stove flew to the superintendent, acreaming, "Come! Come!" The superintendent followed the bird back to the stove and shut off the escaping gas

Dumb creatures are popularly supposed to give warning of threa ened danger but they do not always live up to this reputation. Eight trained chimpanzees were asphyriated by coal gas when a chimney became clogged with soot, and only a two-bour siege by a Brooklyn, N Y, inhaitator squad saved them. A coffee pot builed over



Mistarps Cost Unite Sam M re That \$5, 2, 20, 20 a Ten

Accidents took a toll of 101,000 lives in the United States fast year. The 9,821,000 disabling injuries suffered by Americans in the same period cost \$2,400,000,000 in medical expense, nsurance and ass of waves. Property damage including buildings rated by accidental fires reached the stagge n. Intal of \$5 500,000,000.

Mrs distribution to the contract of the the same of the house of the same of the same CANADA TO PERSON OF A STATE OF THE top a second or part of the many as a tiple and The are many as the paper a a teacher as thomas a way with an a e pertia to a harmonia a water

property of the second Chi to he've a large builty North by the to an application and application of the K bis M proper for an and a firsts a constitution to the constitution of the se with a strang were registed and the second of the second

and doused the flames of a gas stove in the apartment where a waman lived with six pet snakes. Both the mistress and reptacs were unconscious when neighbors broke in and carried them to safety.

Not infrequently, it is the rescuer who finds himself layured, while the person or animal in danger escapes. Mrs. Sarah Nelson leaped through the window of her third-story New York apartment when an oil stove explaned set my fire to the room. Juhn Mobley who happened to be passing saw her as she flung her self into space braced his body and broke her tuil. The impact sprained his back while she was abic to wak away without help.

From eleven in the morning until nine at night a cut mewed moure fully from a tree in Brooklyn, N. Y. As the hour of curiew rang, Walter Fournays, a chauffeur, climbed the tree took the kitten under his arm and prepared to bring it down to safety. A small branch broke un-

der Fournay's weight and he fell fifteen feet, fracturing his skull on the sidewalk. The cat landed safely.

A Chicago policeman, answering a call from frantic mothers, shot himself in the leg while trying to bring down a stray dog which had been mapping at children. Undounted by the self-inflicted wound, he killed the animal with the second shot

Of course, not all the odd accidents happen at or near home. With the suddenness of thunder, they occur unexpectedly anywhere. Too, many result from carefully and plans to avoid injury while performing a dangerous job or basty at-tempts to escape from impending tragedy

Two-hundred-pound William Philupe New York baker, turned out the fire under one of his bake overs one Friday night. On Monday morning, thinking it had cooled. sufficiently for him to enter to repair a faulty grate, he crawled into the narrow brick-lined fire box only to discover that heat from an adjoining compartment had shot the temperature up to 350 degrees.

By Andrew R. Boone

In an effort to back out quick v the baker became tightry wedged Unable to pull Philape out, his employer called police whose rescar sound permulished the steel door and brick masonry by means of acetylene turches and tron tiars. Thirty minu es la er suffering first-degree burns. the victim was litted from the oven.

Sailors on the French destroyer Ourseen fired

S'ipping on a cebe of soap while bothan plunged through # therdestory weredow A pile of sand broke her fall and the tracaped with only minor bracket

> several practice torpedoes which raced through the Atlantic true to their marks and exploded. They then shipped into a tube a new torpeda to test its range. The projectile leaped into the sea, swiftly turned

in a circle, crashed into the ship near the stern. Had the defective gyroscope which governed its direction been placed in une of those containing high explosives, the Ouragest today would be rusting on the bottom of the ocean

Scott Kine manager of an electric company at W kes-Barre Pa. faced mminent e eclaucation for thirty musutes not long ago under bizarre circumstances. He was replacing a salety fuse governing a powerful current when a bushing cracked, loosing a 11 000 volt current which set up a powerful magnetic field.

Kline fell to the floor and unable to move, suffered a series of shocks. He was a prisoner of electrically induced magnetism a full half hour, until a he per arrived and turned off the current. Yet he received no burns.

After facing death while washing a window on the sixteenth floor of a skyscraper, Michael Kasp fractured his ankle during a self-rescue. Karp had finished cleaning the window and unfastened one end of his safety bett, when he slipped off the narrow ledge. In his frantic efforts to crawl back up to safety be cracked his ankle

Explosions, from toy gas balloons to tons of powder, bring injury to many under strange circumstances and in odd places. A large crowd at Ham bon Fish Park, New York gathered to hear a speech by Mayor LaGuardia, was thrown into a near panie when two duzen gas-fi led balloons, carried by Murris Berebaum, exploded and burned five people, including two liabies. How they were set off no one knows, unless by a lighted cigarette, touched accidental-

> But to get back to the home-at Bordeaux, France, an entire family was engaged in a mouse hunt when the mother shoved a hat poker back of the kitchen sink hoping to force a mouse out into the open. The hot metal touched a quantity of explosives stored there by her husband. The heart blew out one side of the ke ben and an ared all six in the

> ly or purposely to one of the spheres.

In Tennessee a home accident not only resulted in the house burning to the ground, but also touched off twenty cases of dynamite and 250 kegs of biasting powder stored next door which descroved fifty homes and bur dings. Isadore Overman, New York junk dealer tossed one of a shipment of old shells in a fire to determine whether they were luaded. His question was answered when a large piece of metal em-bedded their in his thigh. Flying chips broke windows in houses as

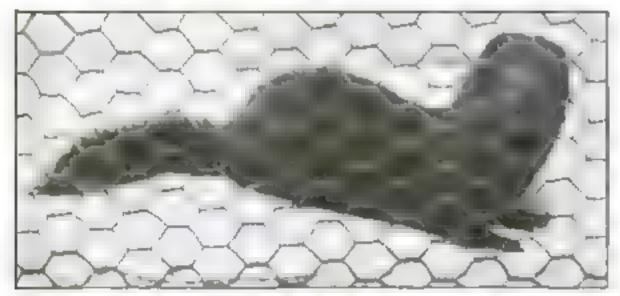
far distant as three blocks.

Where are you safest-rocking in your favorite chair sitting at your work desk in a theater, watting in shallow occup surf or standing in Communed on page 1161



In another fresh Accident, a locomotive engineer was knocked out by a six-pound pheasant which flow in through his window

\$10,000 MINK COATS



A male mink raised on a back-yard fur form. This animal won a prize at a show held by breeders

F THE 250,000 mink pelts that reached the American for market last year, one in every five came from an animal grown in captivity. Many were produced at midget farms established in out-of-the-way corners.

Typical of the back-yard fur farms which have appeared in many parts of the country is one maintained by Michael Hasks on the outskirts of Akron, Ohio.

Seven years ago, Haska bought a pair of breeding mink for \$200. Now, he has 100 pens and more than 400 animals in his wire-enclosed back yard. The litters range from two to ten pups, the average being five. Animals hern in May are ready for market the following November and their pelts bring from five to thirty dollars apiece

The cost of razing a single mink is ap-

proximately a dollar a year. Its food consists mostly of meat with a little grain and vegetables thrown in. Haska men a mixture of fish and beef. He gets his fish from a local market in the form of scraps and bones. When horse meat is available, it is satisfactory for feeding the animals. Young mink are fed twice a day; grownup ones only once, in the evening

Related to the weasel and about the size of a small cut, the mink is one of the hardest of the fur-bearing animals. The mortality rate at Haska's one-man farm is about two animals lost for every hundred

The pens are wooden frames with chicken wire nailed to all six sides. It is necessary to have the wire extend over the bottom to keep the animals from digging their way out. Inside the cages are the little bouses

Skins of Uniform Quality
And Beauty Grown under
Artificial Conditions in
Profitable New Industry

WALTER E. BURTON



This baby mink was born in captivity



Occupying the back of a city lot, the mink farm shown above houses more than 400 animals. The cages are tagged to provide breeding records

Raised on Back-Yard Farms

where the mark sleep. Watering crocks complete the equipment. Recently, Haska has added a number of new-type pens which have the sleeping quarters attached to the outside to make the work of cleaning them easier.

Surrounding the yard is a high wovenwire fence having a wide strip of galvanized from at the top. This prevents the mink, if they escape from the pens, from climbing over the fence to freedom. When a few of the animals escaped before the fence was built, most of them bung about the mink farm until Haska caught them in special box traps batted with food.

All the animals have white spots or patches under their chins. These are to mink what fingerprints are to humans. No two spots are exactly alike. At one time, these patches were used as distinguishing marks in registering the animals.

The color of mink for varies from light brown to almost jet black, the latter being the most valuable. The size, rumously enough, has little to do with the value of a skin. According to Haska, the characteristics which make a pelt valuable are dark color, silky testure, and dense underfur.

The average mask coat contains from sixty to eighty skins. Yet, it will weight only about four pounds. Priced at from \$3,000 to \$10,000 apiece, such coats cost as much as \$2,500 a pound or approximately \$160 an ounce! However with good tare, the garments will look like new after half a gozen years of use. It is the combination of lightness and warmth that gives mink for its great value as a material for making coats.

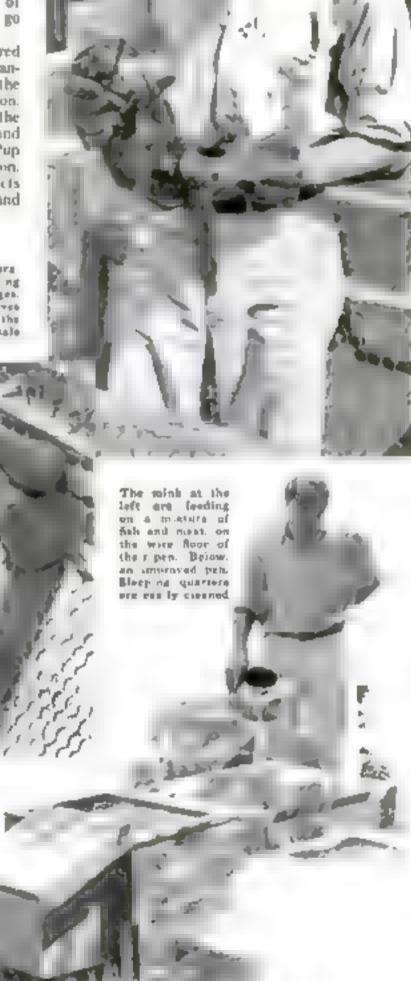
In making a coal ar expert ma ches the pelts for color and texture. Sometimes, he will go over as many as 10.000 skins to find sixty that can be placed together. Increasing the difficulty of this work is the fact that pelts coming in from trappers all over the United States and Canada vary according to the locality. Now with an increasing

proportion of skins coming from for farms, where the breeding stock is standardized, the work of the experts promises to be easier

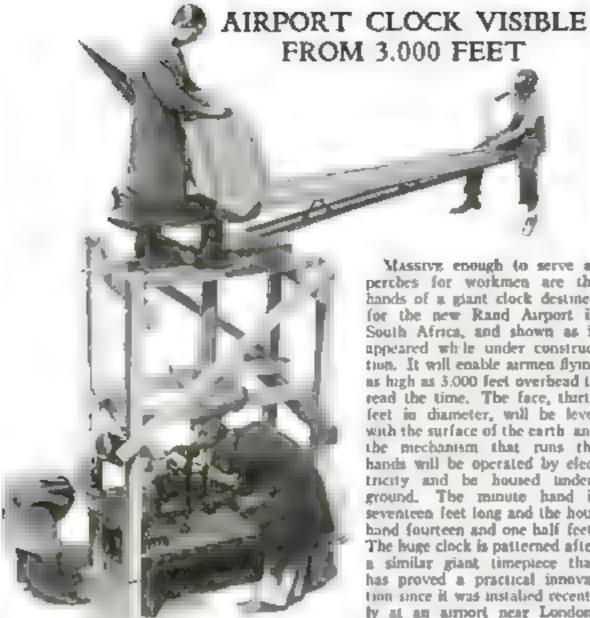
Two kinds of mink are commonly bred in captivity. One is the type familiar in the eastern part of the United States, the other is from the Yukon country of Canada and Alaska. The latter is the largest and its fur is used for chokers and trimmings, while the pelts of the smaller American mink go into the body of the coat.

Last year, Haska entered some of his animals in the annual show sponsored by the Ohio Fox Breeders Association. One captured the cup for the "Grand Champioo M nk" and another won the title of 'Pup Champion" of the exhibition. In all, his back-yard products carried off twelve ribbons and a sever cup.

Michael Hacks, for-farm operator of Akron. Ohio seamining one of his walkable charges. Hacks uses heavy lee her gloves to protect his hands from the sheep teeth of unruly asimale.



A portable box trap used for recupturing mink that escape from their pans. The entire farm is now surrounded by a high wovenwire fance which has a wide serip of galvanted from at the top



Massive enough to serve as perches for workmen are the hands of a giant clock destined for the new Rand Airport in South Africa, and shown as it appeared while under construction. It will enable airmen flying as high as 3,000 feet overbead to read the time. The face, thirty feet in diameter, will be level with the surface of the earth and the mechanism that runs the hands will be operated by electricity and be housed under-ground. The minute hand is seventren feet long and the hour band fourteen and one balf feet The buge clock is patterned after a similar giant timeptece that has proved a practical innovation since it was installed recently at an autport near London. England.



MOVE DATE PALM FOUR MILES IN BIG TRANSPLANTING JOB

A seventy-root date palm, sole survivor of twenty-one that were brought from Morocco to San Diego, Calif., more than half a century ago, recently went for a four-mile ride across the city. Set up by a derrick at its new safe. as shown above, it constitutes one of the biggest transplanting jobs of its kind. A hole thirty feet in diameter and fourteen feet deep had to be dug for the roots.



TINY BULB ILLUMINATES POLICE BADGE AT NIGHT

So THAT railroad police assigned to yard daty may read by identify themse ves after cark, an illuminated badge has been introduced. Flash-light cells mounted on the back of the badge provide current to light n small bulb when the user presses a switch as shown in the photograph above.

BLOTTER SHORTENS LIFE OF INK IN SIGNATURES

BLOTTERS should never be used to dry signatures on important legal documents and state papers, according to the U.S. Bareau of Standards, since removing the greater part of the ink will shorten the life of the writing. When signatures are required to remain legible for many years, as in all papers that are valuable as matters of record, the tak should be allowed to soak into the paper and dry there.

SOIL TAMPER HOPS UNDER OWN POWER

A 'JUMPING TACK soil tamper that leaps up and down under its own power has been developed in Germany to speed toad construction. Explosions of gusolme in a cylinder project the device upward, and the heavy impact of the falling machine stamps the earth as forcibly as a steam roller Since the cylinder is tilted forward, the mathine moves in a series of short, froglike bops, requiring only slight goodance from the operator through a pair of long handles resembling those of a wheelbarrow



Using its own power, this jumping temper speads up road building

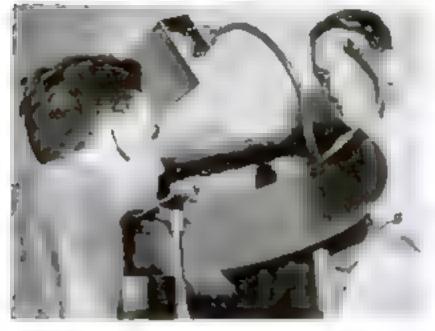


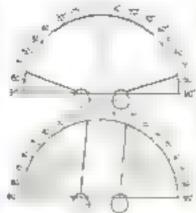
Flexible telluloid engraving glass to wood block

MAY MAKE ENGRAVING PLATES OF CELLULOID

ENGRAVING on cell u old is said to be made a possibility by a recently tested process, intended to provide a substitute for the copper plates ordinarily used in printing illustrations. After the celluloid has been etched by a special chemical process, it is mounted on a wood block in the customary way except that glue is used mstead of tacks. Cut blocks are therefore asable to the extreme edge, requiring no "shoulder." The hardness of the material is reported to enable it to stand up well under long press runs, a single cut yielding as many as 100,-000 satisfactory impressions.

EYE TESTER HELPS PICK FOOTBALL TEAM

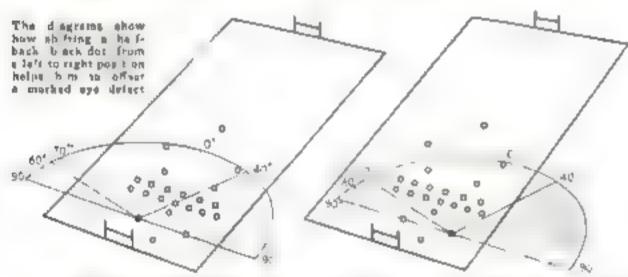




These charts are made in vision result by the machine at the left. The top one in that of normal eyes, by the lower chart an estimate case of tunner," vision is shown

WHEN a halfback on the University of California variety football team persistently failed to dodge opposing tackles, the coach didn't take him off the aguad. Instead he sent him to the laboratory of the team's eye consultant, Dr. A. R. Reinke. By shifting colored targets along a curved track until they disappeared from the player's view, the examiner discovered that he could see practically nothing out of the tail of his right eye. On the doctor's recommendation, the coach shifted the player to the right side of the hae, where his good left eye enabled him to make a stellar record. Similar tests for all football players have now been insti-

tuted by the university, where they are proving of vital importance to football strategy. Normal persons, while looking straight ahead, can still see objects approaching from either side, but a temporary in ection or permanent eye defects may limit some persons to a range of vision within a few degrees of the direct line of sight. A sufferer from "tanner or "pinhole" visson, as this defect is known, may not even realize it, since his eyesight for reading or in conventional eye tests seems perfect, but he may unknowingly be a menace at the wheel of an automobile or a liability to his team while playing on the football field.





LEVER REPLACES PULLEY IN SIMPLE CHAIN HOIST

Costexa a fraction of the price of a conventional chain hoist, a simplified new type for garages, farms, and factories employs an ingentious lifting principle When the handle is pumped up and down, claws on a casting attached to it alternately engage opposite sides of a hosp of chain causing the load to climb the chain. So elyprojections on the casting preven the load from aloping or dropping act dentally. Any length of ordinary three-quarter-inch pape may be used as an extension handle for the hoist, which is designed to lift loads up to half a ton.

HOT ROOF OF ATMOSPHERE

Recent experiments indicate that an intensely bested layer hitherto onknown to science, may encircle the earth's atmosphere. Tests with radio waves place its height at 150 miles and its temperature at 1700 degrees F

BUILDS REMARKABLE SCALE MODEL OF SUSPENSION BRIDGE

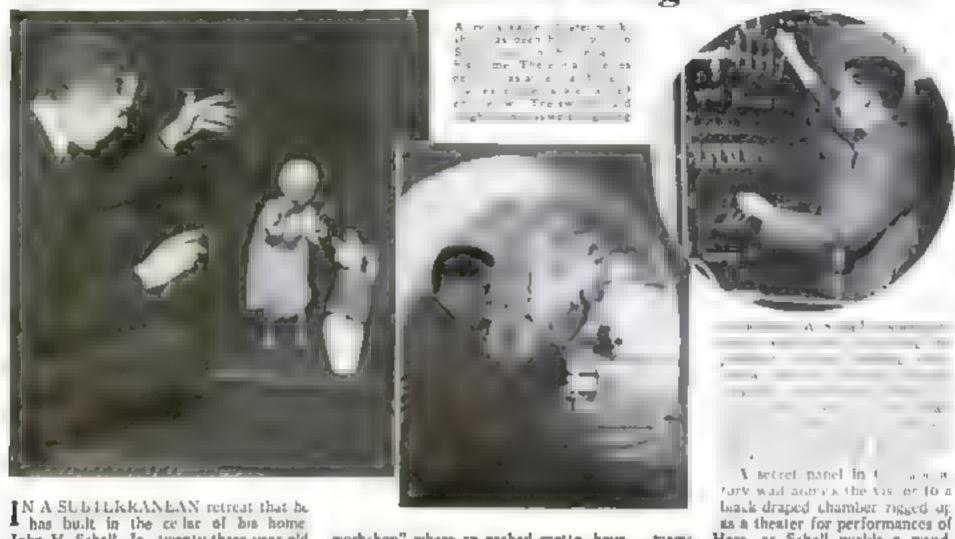
FROM brass wire, thread, and plaster R. S. Rootins, of Vancouver, Canada has constructed so realistic a model of a bridge projected to span the city s harbor entrance that in a photograph t might be mistaken for the real thing To make a scale model of the 1 500foot suspension span he cut each piece of wire to the required length placed them on a flat surface, and soldered them in place, Miniature scenery placed at the approaches, and a model ship riding on plaster water beneath the bridge, add to the realism of the bridge proper which gives the illusion. in pictures that it is the actual span at the entrance to the barbor of Vancouver British Columbia, Canada, The model required four months of work. The proto-type of this model will have a main span of 1,500 feet supported by towers 800 feet high. The center of the span will have a clearance of 200 feet at high tide.



The picture below is not that of a twabridge but of a model made of brass wire, thread and place or The builder at aft required four months to make the countless cutting and suidering operations



Student Creates Cave of Magic in Cellar



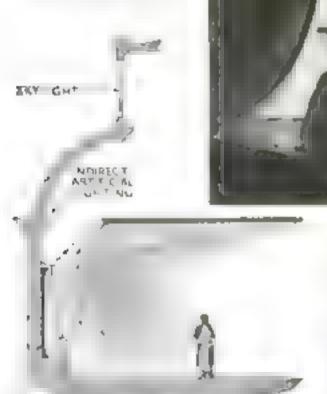
John H. Schall, Jr., twenty-three-year-old medical student of Brooklyn, N. Y., pursucs his spare-time bobbies of magic and chemistry. Colored lights and ingenious theatrical effects, devised for the entertunment of his friends, provide a setting sulted to represent an imaginary meeting place of alchemists and sorcerers.

Through a coffin-shaped entrance, guarded by a skull with flashing green eyes, a visitor steps into a dimly lit "alchemist's

workshop" where an urched grotto, houring microscope, retorts, and graduates, is bathed in blue light from a hidden source. The grotto is not for show alone; at the touch of a switch, bright lights transform its table into a practical microscope bench, while surrounding wall shelves bespeak a weal-equipped chemical laboratory A homemade ventilating system exhausts nomous vapors from an experiment cabinot: and an electrical pumping system, almagic Here, as Schall wields a wand

colored streamers of ribbon appear from seemingly empty boxes, cards do builling tricks, and marionettes perform upon a midget stage illuminated by working, reduced-scale models of spot ights and flood lights. An organ, reclaimed from the junk pile and put in working order, furnishes music during a performance. It also provides special sound effects to heighten the dramatic effect of a program

CURVED GLASS COVERS FOR ART ELIMINATE REFLECTIONS



DU HEED ! WE

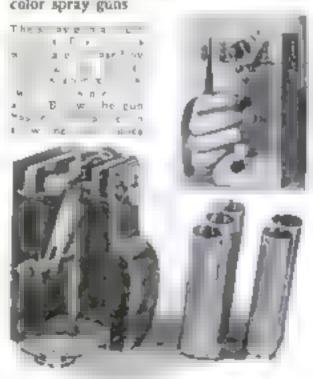
PATH OF JICHT, SE LINES SHOW SHIP

F ELD OF YEW

OBJECTIONABLE reflections on glass-covered pictures, detracting from the enjoyment of vesitors to art museums, may be banished by a scheme already appared successfully to show windows. When a window front is curved as in the photo above. so that a dark ceiling is the only thing reflected, the glass becomes virtually invisible to the onlooker. Similar arrangements suited to the display of pictures in art galleries were described recently before the Royal Society of Arts, in England. One of the proposed methods is shown in the diagram at left.

PAINT GUN SPRAYS FIVE DIFFERENT COLORS

SPRAYING any desired tint is made easy by a multi-colored paint gua, invented by a French engineer. Any one of five colors. contained in individual cups, may be used at will by pressing a corresponding but ton. To mix colors, two or more buttons are pressed at once. Compressed air operates the device as in conventional sing ecolor spray guns



PICTL RE *

SPECIAL NONREPLECTING

GLASS COVER

The Man Survinces with the Net

JAMES WATT designed a steam engine which is still pumping water in England One hundred and twenty-one years old, it was built before the battle of Haterian.

CRICKET FIGHTS are papular sporting events on the Island of Ball.

FROGS, rather than apex, were our remate ancestors, according to a new theory of evolution advanced by a Swedish scientist.



PARROT FISH of Bermuda can bite through on ordinary fishbook.

EVERY five seconds, on the average, on American goes to a hospital.

WHITE TEACHERS are instructing indians at a New York reservation in the art of making flint acrowheads.



BLOODSHOT glass eyes are made by a mestern firm for users who want both eyes to match on the maraing ejter the night before.

RUBBER PLATES are new used on printing books.

RARE OCEAN FISH are bring collected from the etomochs of larger fish by French ichthyologists.



HOUSE FLES more their wings 130 times a minute; butterflies only nine.

BREAD 2,000 years old mos taken from a buried area in Egypt,

OSCAR, the polar bear at the Rachester, N.Y., 200, is the most photographed animal in America. New firms are texted by photographing his creamy cost against a dark background.



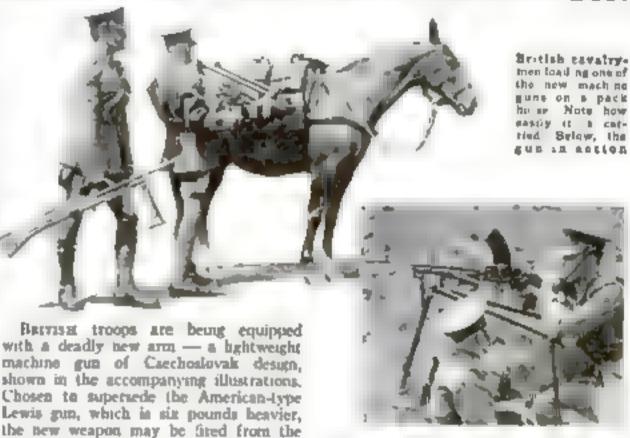
ODD AIR LOCKS HELP RAISE WARSHIP

WHEN Scottish salvagers recently succeded in raising the German warship Konig Albert from the bottom of Scana Flow, where it had rested ever mace à was scuttled by its own crew with other ships of the German Fleet in 1919, towenny stacks atop the upside-down hull gave the vessel the curious appearance shown in the accompanying photograph. The 100-foot-high arr locks were used by salvagers in entering and leaving the hull while it was being refloated.



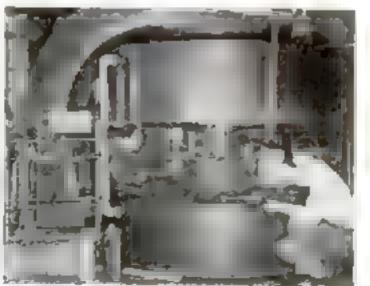
The bull of the German warship Rong Albert, so it appeared when raised

BRITISH GET LIGHT NEW MACHINE GUN



overheated, the other may be substituted; the change requires only fifteen or twenty seconds. Twenty-four of the new guns will be issued to each infantry bettaken.

ARTIFICIAL RADIUM MADE FROM SALT



shoulder like a rifle or operated upon a

two- or three-legged stand. It fires 600

shots a minute. Two interchangeable har-

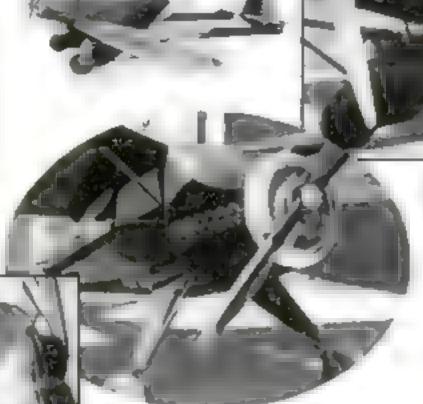
rels are provided, so that, if one becomes

This hage magnetic machine makes artificial radium

AFTIFICIAL radium may soon be available in quantities sufficient for medical use, as an inexpensive substitute for costly natural radium. according to its discoverer. Penf. E. U. Lawronce of the University of California. To obtain it, ordinary table sait is bombarded with electrified particles in a huge marnetic device known as a cyclotron. The "ratho - sodium" thus produced etnits tays even more powerful than those of radium, which costs about \$2,000,000 an ounce, and its possible latre-scale manufacture is foreseen as a boon to medicine for the treatment of diseases, and for experimental use.

NEWEST FLIVVER PLANES RESEMBLE AUTOS AND USE STOCK AUTOMOTIVE ENGINES

AIRPLANE designers are turning toward automobile lines, in their latest mixiels introduced for private flying. Stripped of its wings, the fuselage of one of these new planes would bear a striking resemblance to the body of a modern motor car, even to he automomie-type radiator at the front, which the propeller cools after the fash on of a grant fan blade. Lifting the hood reveals a stock automonde motor arm lar to those used in popular low-priced cars and capable of being repaired by any garage mechanic; special genring adapts it for surplane use. Interior fit tings including instrument panels and coll-down windows, are



Another small plane for private fiving Ar less coining the hood seven as a stock autology management on continual co

Its automobile-type body radiator, and engine make this place a Verlable flying pools; car Small view shows it in flight

also of automobile type. The new places, according to the makers, take advantage of the economies resulting from mass production, to which automobile design lends itself

One model of the new "flying autos," a low-wing monopone of thirtyfour-foot wing span which recently made its initial test flight in Southern California, carries two persons at a crusting speed of 100 miles an hour It uses ordinary automobile gasotice

as fuel thes about therevehree miles on a gallon, and will be sold at a figure comparable to the cost of a medium-priced automobile. A slightly smaller craft, to reduced by another maker, is a high-wing, two-place monoplane with "knee-action" landing gear. Wing flaps serve as air brakes and enable it to land in a space only 200 feet long

HE PRODUCES FOGS FOR THE MOVIES

И ием в точе всепано calls for a for, it a a busy day for the technician operating the valves in the picture at the right Employed by a Hollywood, Calif., studio his odd specialty is the production of any required degree of forginess, from a ight baze to the "pea soup variety for which Landon. England, is celebrated, Discarding the chemical mixtures previously used for ortificial fogs, because they irritated the nose and throat he devised a substitute by spraying maneral oil from a nozale with compressed air under high pressure. By beating, he controls the height to which the fog will rise



GREENHOUSES ARE BUILT AROUND GIANT CACTI

BECAUSE the plants were too large to be placed beneath a glass roof greenhouses were constructed around the bases of two giant cacti recently acquired by the Huntington Botanical Gardens at San Mariao. Call f. The cacil are of a species pative to Avisona, where they sometimes a tain a be ght of sixty feet. It is the only giant cactus that thrives virtually without water for periods of two and three years. Protection was required from excessive moisture, which rots the bases of the planes.



One operation locks safe to auto steering wheel

PORTABLE SAFE LOCKS TO STATIONARY OBJECTS

To provide a secure place for a traveler's money, papers, and other valuable objects, a new portable safe has been in troduced. Its locking ring may be attached in a july to the steering post of a car, or to an immovable piece of furniture in a hotel room, making it importable to carry away. Made of two sturdy telescopic steel sections, the safe is declared to be proof against tampering. A single locking operation fastens the two sections together and attaches the safe to the stationary object.

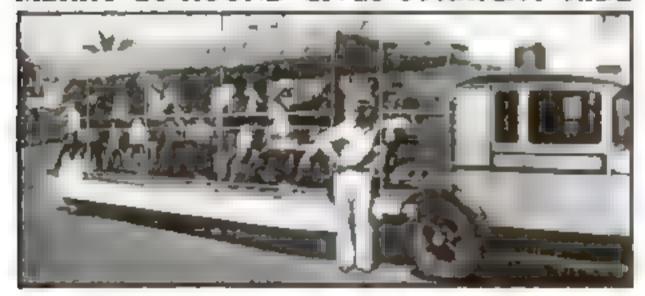
FANTASTIC PLANE HAS CROCODILE NOSE



A captrague nose with painted jaws and teeth gives a new Russian plane its mekname of the "flying crococide" Designed for advertising purposes, the odd craft affords an arresting spectacle during

flights from its base at a Moscow airport. The photograph above shows the striking appearance of the big twin-motored machine, which has a seating capacity of nine persons.

MERRY-GO-ROUND GIVES STRAIGHT RIDE



Towen by a truck, a new "straightaway merry-go-round" designed by a California inventor gives children an exciting ride. When the vehicle is in motion, an eccentric attached to the rear aide of the trail-

er imparts a galloping motion to sixteen horses. An operator at the rear, by pulling a lever, can disengage the horses from the driving mechanism if anything goes wrong while in operation.



WOMAN'S PURSE HAS CIGARETTE DISPENSER

So that digarettes will not become lost or crushed among the miscellaneous contents of a woman's pocketbook, a new purse is provided with a built-in magazine and a handy dispenser. When a knob on the side of the pocketbook is turned, a single digarette is ejected from a small aperture, making it unnecessary to open the bag. The magazine holds fifteen digarettes and these are kept in place and fed to the ejector by a flat, flexible apring. As one digarette is ejected, the next crops into place and the user always receives a firm, unbroken digarette.

SCULPTURES HANDS FOR PERSONALITY STUDY

Studies of human hands are the unusual specialty of Helen Liedloff New York sculptress, who maintains that they suffice to reflect the personality of the atter. Among the

celebrities she has pictured in this way are Albert Einstein, famous physicist, whose abort, plump hands are shown resting upon a globe, and Sergei Rachmaninoff, renowned composer, whose lean, agile fingers are depicted on the keyboard of a piano.

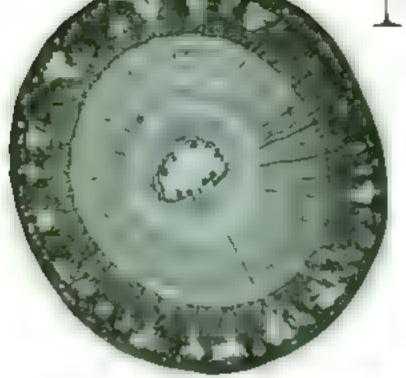


Models of bands which show distinct personstrices. Einstein a hands are short and plump, while Rachman.ngd's , right, ere less and again



Helen Liedloff sculptress of hands, at work in her studio

Microscopic



OSSIBLY you are all set for a microscope journey but have no place to go. At least, so you think. But if you have a botany test-book it will offer suggestions for many in cressing crips.

Even of you concentrate on only one small but important part of the plant structure you will find no end of materia. Su, is pose for instance, that you decide to investigate stems—to look at all kinds of stems, and to said up in various ways and examine every stem you can get your hands or.

Sounds simple, doesn't it? The work of an hour or two, you think. But in truth it would take you weeks, months, even years to learn all there is to be known about stems. A piece of lumber is nothing but part of the stem of a free. And there are scientists who do nothing but study wood.

A stem's main job in life is to support the leaves. It also carries water and food, and assists in other minor ways. Botanists classify stems as herbaceous and woody. The first fond is much like a leaf in construction. If you nice a herbaceous stem, such as that of a clover plant, crosswise into very thin sections and

examine one of them with your microscope, you will see that the stem has a distinct structure.

There is encircling it, a thin layer called the epiderius. This is composed of transparent ce is. Directly below it is the paic green chlorenchyma which, by its cotor suggests that it helps out the leaves in the manufacture of food for the plant. Next, in order, are the veius, known by a variety of aliases such as fibrovascular bundles, vascular bundles, or just plain bundles, vascular bundles, or just plain bundles. Usually these veius are grouped into a ring, encircling the center section of the stem. Under the microscope the veius water pipes of the plants, are usually very ristinct. There job is to carry water through the stem. In the center, enclosed

A stained section of a basswood stem, magnified fitteen times. The pick century is surrounded by rings of woody ce is and beyond character the sanctiat bundles.



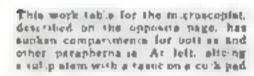
Stems of Common Plants Afford An Almost Unlimited Field for Amateur Study and Observation

By MORTON C. WALLING

by the ring of veins, is the pith, a sort of lood-storage reservoir for the plant

In older parts of stems, there can be seen (urther refinements in the stem structure. Extending through the bundles of cells making up the veins, and uniting them into a sheath, or ring as it appears under the microscope, is the cambium layer, the seat of growth in the stem. It is this layer that, by cell multiplication, grows and produces new material both misde and ou

Then there is, directly beneath the almost transparent epideritus, a white band of tissue that elistens when the flumination is right. This is the collenchyma, a reënforcing sheath whose function is much the same as that of the wire or frontrod reëforcements in a concrete pole. Enri-



neers have copied this cohenchyma in the building of airplane frames with steel tuling that is light in weight yet strongly resistant to lateral strains.

Tear almost any soft stem into shreds and examine the particles under the microscope. Among the masses of tissue you will see long tubes resembling tightly colled springs. These are the ducts or tracheids which help make up the fibrovascular bundles. Other large tubes resembling cylindrical sieves may be seen. These tubelike celts run to all parts of the plant, from root tip to branch tip, carrying water and food. The balsam and some other plants produce stems inthsparent enough for you to see the water-carrying cells without making sections or tearing the

Stems apart

Stems of the clover, geramum, soft tops of tree branches, and almost all other herbaceous stems show in cross section a ring-shaped arrangement of the veins. However, the corn plant is different, Cut thin slices from a young corn stalk and examine them. You will find that, at fifteen or so diameters, the specimen reminds you of a face doily. Among the thin, almost colorless pith cells are arranged, in a more or less evenly spaced fashion, the fibrovascular bundles.

Woody stems are grown-up herbaceous stems. By studying such stems with your microscope, you can learn why leaves fall in the autumn. If you slice a twig lengthwise at a point where a leaf is growing

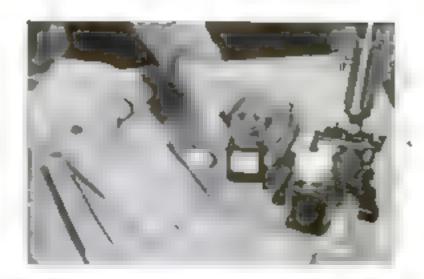
Marvels you can find in your garden

you can see that the veins branch out from the twig and follow the leaf stem.

In the late summer or fall, a layer of these grows across the base of the leaf, gradually closing off the water and food supply. The leaf, deprived of water and food, begins to wither. The chlorophyll quits work and the leaf changes color Finally it falls, dead, to the ground. The abaciss layer of tissue that grew across the base of the leaf becomes a cork, ike seal for the scar left on the twig stem.

Examine a winter twig at low magnification and you will see that it is covered with tiny ward ke projections. These are the lenticels. When the leaf dies and drops off, its stomata, or breathing pores, naturally can no longer serve. But the tree must continue breathing through the winter. So, over the surface of the winter twig the tisual epidermis is repaced by a waterproof layer of corklike material, which is pierced with many lenticels. These lenticels serve as breathing pores in place of the stomata of the leaves. Respiration is vital to the living tassies inside the twig

If you cut a cross section from one of these transitional stems or winter twigs, you will see that (Continued on page 101)



The beauty of plant mems under the microscope is greatly (acreased by the application of a stain, as illustrated shows

Build This Handy Microscope Work Table

AT A recent hobby show held in New York, a young man watched—fas-chated—while an amateur microscopiet showed how a fly's eve could be removed and maunted on a slide in something less than two minutes

"You know," the young man said, leaning forward eagerly, "I've read a lot about microscopes but I never not one because I haven't any place to work."

You can borrow the katchen table for part of the evening, can't you? ' the amateur microscopial asked.

'Sure. But you've got to have a whole room to ride that hobby "

"That's where you re wrong " the amatear smiled. "One of the best things about microscopy as a hobby is that it is convenient. You can practice it almost any place—in the katchen, parlor, bedroom or basement."

The ameteus was sight. You can discover much of the invisible world that

only the nucroscope owner knows if you can find a two-look square space on which to work. However, it cannot be detied that a permanent place to pursue your holiby such as a table or perhaps even a small room set aside for a microscope laboratory as a highly desirable convenience.

Almost anyone can find space for a modest sized table that will house the acconterments of his hobby. The making of a table like that shown in the picture at the top of the opposite page, is not difficult. It does not require emborate machinery. Cost is a matter of two or three dollars for materials.

Almost any wood can be used; redwood page and cypress being among the cheapest and easiest to work. Use oneinch stock sanded on one or both sides. The table, whose construction and dimensions can be determined from the diagrams, is similar to any ordinary table except that it has a comfortable footrest and two wells one at each end covered by hoseed table for the stronge of reagent bot-

The lids are hinged to swing upward outward when they are grasped at heir outer edges with a turning motion. The table shown was made of knotty white pine, and stained to harmonize with other forniture. Its top was painted with a chemical-resistant paint, although ordinary finer or deck paint will be a sufficient cov-

From time to time, additions can be

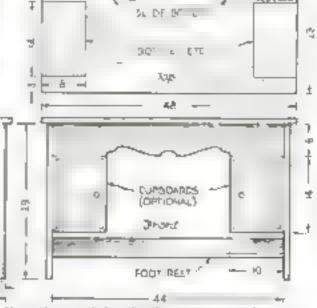
End

made to the table in the form of boxes mounted on the top or directly behind the hinged lids for bolding sides and the like Cupboards or drawers may be installed inside the end pacer as needed.



Details of underside construction above agone of the author compartments for storing booting

- 14 g - -g

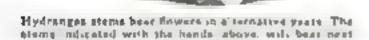


This drawing gives dimensions and details of construction of the work table described above. Copbourds and drawers can be added if descred



AN EXPERT TELLS YOU

How to Prune Your Shrubs FOR BEAUTY



By R. SANFORD MARTIN

flowering plant to the tailest tree, has a definite height at which it attains maximum attractiveness. Since this cannot be changed by artificial treatment, natural growth should be encouraged at all times. This may be accomplished more perfectly by proper pruning than through any trick methods.

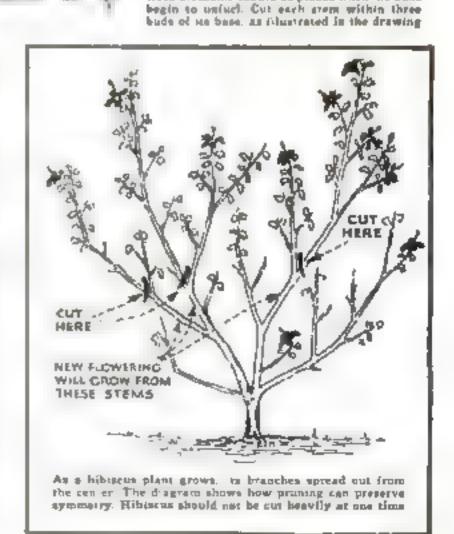
Plants drop their flowers, frust or folinge at different times in the year. It is not possible to prescribe, in limited space, specific pruning periods for the many species. One general rule however, applies to all plants, trim them as soon as they have produced that for which they were grown, whether flowers or fruit

The various ornamental trees and shrubs react differently to pruning. One requires severe trimming and grows even more rapidly than before; another must be pruned by nucressive stages for best results. In the paragraphs that follow, I have attempted to explain methods of pruning typical plants of several families, selecting those most widely planted through the United States.

Fast-growing plants and shrubs of untisual physical proportions, and those grown for the beauty of their flowers and fruit, require more attention than shrubs grown merely for foliage effects. Conditions along the Pacific Coast and in the southwestern and southern states give all plants a much better opportunity to come into flower or fruit earlier than in climates of cold winters. You can easily determine how long a plant requires to produce the twigs bearing either blooms or fruit and

whether this same wood will support a crop the following season. If the plant in which you are interested produces flowers on one-season wood, as do hydrangeas, roses, and bridal wreath, this wood must be removed to make way for new branches to be developed in future seasons.

On the other hand. shrubs such as flowering almond and viburnum which produce blooms year after year on the same spurs require only enough pruning to keep the mam bodies open to the sunlight, either direct or indirect. In pruning for the necessary open effect, particularly on plants growing on the north side of the house remove older branches and any interfering stems from the plant to produce even distribution of



Rose blomame should be picked when the buds

branches and permit moderate penetra-

By removing branches as soon as they have fulfilled their purpose, you can keep new crops of branches coming on through the year. These will grow to natural proportions and set maximum numbers of flowers. Growth of this type is more attractive than bedging, and in the long run requires less attention. On flowering shrubs, hedging destroys most of the plants' flowering children; too, trimming only on the outside shuts out the light so essential to their good health.

Only a few simple tools are required for even the most meticulous pruning. Most valuable is a good pair of band shears with a blade so designed that it will make good, clean cuts without crushing stems. A curved-blade pruning saw, long-handled shears, hedge shears, and pruning knife

complete the outfit

WHEN a cut is to be made, whether on shrub or tree, cut as closely above an old hat scar or bud as possible. A cut of this kind will heal over more rapidly, with less likelihood of die-back or internal rot, than where a cut is made anywhere between leaf scars or buds. This is particularly important where plants are subjected to rains throughout the summer, for continued mossture breeds disease

Plants of the same family may require different pruning treatment, depending upon their use as tree or shrub. Ofcander, for instance appears both as a tree and as a shrub, we h exactly opposite systems of

pruning recommended. Young tree plants should be staked for the first three or four years. Pinch off any buds or shoots that form anywhere along the stem except at the end. Continue this pinching process until the tip has reached a six-foot height, then the top will take care of itself When suckern appear at the base, dig down below the surface and pull them off where they join the root stock.

Where this plant is to be used as a shrub, the sucker growth should be encouraged, keeping the plant at an even height and constantly replenishing the flowering wood. As soon as a bloom cluster has finished flowering, remove the entire stem by cutting it out almost to the ground, which will cause a new growth to replace it. Pruning should not be started on oleanders

until they are at least four years old. Differences in pruning deciduous and evergreen varieties may be easily noted in spices, or beidal wreath. Deciduous spirens may be treated alike, since all produce their blooms in the same way. Pruning may begin after the third year, and should take place as soon as the flowers

have dropped in the spring.

Since the better flowers are produced on young wood, keep older wood cut out and new flowering branches coming on. You will note, when the shrub is in full bloom, that the older stems bear fewer flowers. These branches should be cut well down to the base, as soon as the petals have dropped, leaving a stub of about six inches. New shoots will form on these stubs, and will flower in the following spring. Some of the spireas spread widely, and in such cases the apreading branches should be trammed close to the ground to encourage center growth.

The evergreen spires requires an entirely different type of primag, which should be carthe plant is in bloom. The best flower clusters are borne at the ends of the branches. The secondary bloom, or that which grows out from side buds after the main flower has been fully developed, will not be as large a cluster, nor will it show up much on the plant, because it is down in the hady of the shrub. This secondary bloom should not be considered. As soon as the main dower has dried, cut off the entire stem upon which it was borne, leaving a

ROSES are, by nature, deciduous plants, and should have a definite period of rest once a year. However, in mild climater they will grow as evergreen plants if allowed to do so. In fact, in the milder climates of the South and West they are very likely to wear themselves out with overblooming and by remaining continuously in a growing condition.

stub of about three inches. New shoots

will appear upon these stubs, and in time

will make flowering stems.

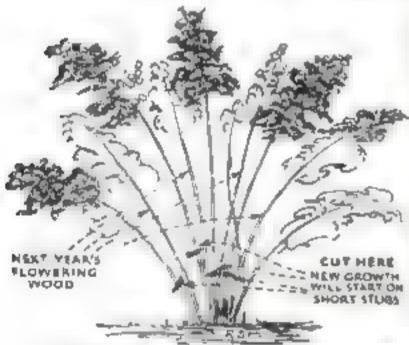
Roses should have a heavy pruning every two winters, and a light cutting lack in alternate years. This treatment will keep the plants in a good, healthy growing condition, which will develop plenty of flower-producing wood if they receive

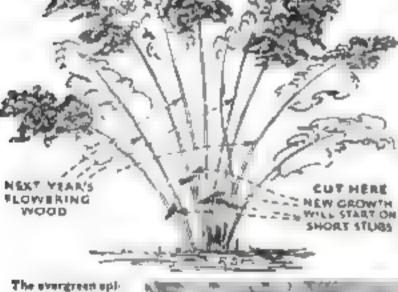
the proper amount of fertilizer

In heavy pruning, which should be done in early December, remove about (wethirds of the plant's growth, cutting out the heaviest wood first in such a way as to have the bush evenly balanced with fairly young branches. All new growth should be taken back to within three buds or leaf scars of its base

When the spring growth starts, there will be danger of suckers springing up from the root stock. This is particularly true of budded or grafted roses. Remove these suckers by digging down below ground level and cutting them off smooth where they are attached to the root. All of the best roses are either budded or grafted onto a hardy, disease-resistant root stock. and suckers from this stock will sap the

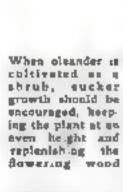
top of all vitality if allowed to grow In light pruning, you need only thin out. the interfering branches and cut all of the newest growth back to three huds or leaf





The overgreen uplrea abou d be prunnd anythioma. As soon as a b port orton, cut off the musica neurs share bare it leaving only a short stub

ALL DOG THE CO









Side branches of cyptose trees, to ling away from the main golumn, may be cut off as shown

Attention should be given to the picking of rose biossums, as part of the general pruning. Pick the flowers when the bods begin to unfurl, cutting each stem within three buds of its base, regardless of the length. There will always be one bud at the extreme base of a stem, so count two buds or leaf scars above this one and sever the flower stem immediately above this last bud.

Roses should never be allowed to go to seed, as this reduces the flowering ability of the plant. In removing the seeds, fullow the same method as in picking a flower in order to make way for additional flower wood, Good-quality roses will not be produced from the buds farther out on the stems.

THE beautiful hydrangea is universally grown, yet few understand the care needed to produce the largest flowers. When the plant is in full bloom, only about half of the stems carry flower heads. This is a natural condition, and this year's non-productive stems will broom next year. When the flowers have dried up or fallen, all stems on which the flower heads were borne should be removed. In removing these stems, cut them out almost entirely leaving only two buds or leaf scars at the base of the stems from which future flowering wood will come. Hydrangeas should be pruned annually after the fourth year.

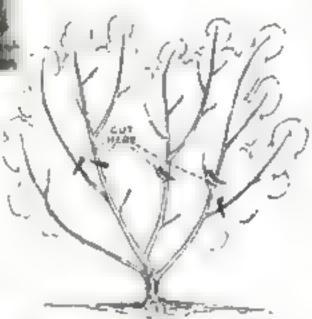
The hibiscus should not be cut heavily at any one time. When the plant gets too large for its location, the larger branches have a tendency to grow out from the general center of the plant, at all angles. In selecting wood to be cut out, pick the lambs from several parts of the plant, so that too big a hole is not left in any one place. Do not remove more than a third of the largest branches at any one time. It will be better to allow three or four months to clapse between heavy cuttings.

The hibercus produces the best flowers when the plant is growing rapidly, and cutting out of the coarse wood will promote growth. Where all the wood is left on

these plants, year after year the flowers will gradually lessen to size until they are about half the normal proportions.

The Cotoneaster type of berry shrub includes a popular and beautiful group. If you will follow a consistent system of cutting, your plants of this family can be kept practically the same size year after year, and loaded with berries every season. Remember that berries are borne on one-year-old wood noly, and once that wood has produced a crop, it is through fruiting. New wood must be produced each year for a proper setting of berries.

Printing may start on the Cotoneasters any time after the plants are three years old, and should be done on all varieties as soon as most of



Prequent to mm ng of privat promotes dense foliage. The drawing above shows how to cut

the berries have fallen. In cutting sprays of berries for Christman decoration, keep the pruning of the plant in mind. When pruning these two-year-old branches, cut them six or eight inches from their base. This will cause the new growth to push out on the old stub, within the first three or four inches below the cut. This family of plants is particularly subject to throwing out new growth immediately below

any major cut; consequently, they become top-benvy very quickly when they are cut high, or hidged

Smaller varieties of Cotoneaster require little pruning Since they are most by of dwarf and trailing hard s of growth, about the oney thing that can be done with them is to keep them sufficiently thinned out by cutting well into the body of the plants to encourage graceful growth.

Hedges and trees are definitely shrubs in the ocnamental sense. In starting a new bedge, it is advisable to allow the new plants to attain the height desired of the bedge before stopping the terminal or end development. Once this height is attained, never allow any growth to go above it. As the plants grow from this point on, they will fill in the body of the hedge Frequent trimming promotes dense foll-

Hedge trimming is, possibly, the simplest form of prusing, however, since the human eye is not always infallible, tightly stretched strings will belp you to achieve straight lines. You will find it easier to trim off the top of the hedge first, Stretch a line at the desired level from one end of the hedge to the other a little to the side, and trim with the shears down to the level of this line

Next, by setting stakes at either end of the hedge, in line with the desired edge, and stretching lines along the top and bottom, trim out all growth that is out of alignment between the two strings. The result will be a next hedge the first time over.

Some bedges require heavy trimming every year, in early spring, immediately before new buds begin to develop for the summer's growth. If a clean and accurate job is done, the lighter trimming may be undertaken during the summer, whenever necessary, without the aid of guiding lines.

The type of shrub selected for the hedge is largely a matter of personal choice. Within the privet group are several hardy, fast growers that are usually planted when a screen is desired quickly

The desired beight may be maintained undefinitely by keeping the plants thinned out, or removing some of the largest, coursest branches every year. In thinning select the largest branches, or those growing most out of bounds. Take them out entirely, well down into the body of the plant. As the private are grown mainly as a foliage plant they may be primed at any time of the year, but the heaviest cutting should be done during the winter while the plant is dermant.

Trees are as much a part of your scheme of shrubbery as bedges. Shade trees should be given close attention during the first three or four years of their growth. Training for a straight trunk, the first requirement for a shade tree may be accumplished by etentioned on page 115.

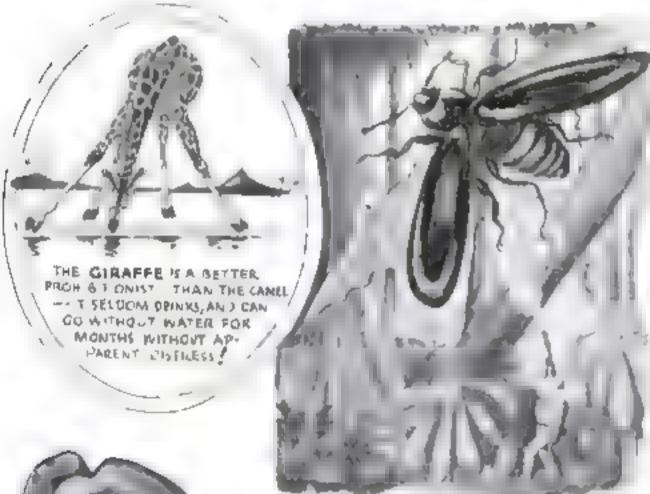


Bearing branches of Cotonnauter, like the upper one in the photograph, should be not away after bearing to increase the pinet's vita ity. The lower branch is of this year's growth, and will have betries next season

Un-Natural History Gus MAGER

HIS FREAK, THE GIANT ANTEATER CENTRAL AND SOUTH AMERICA) SEEMS A TOSS-UP BETWEEN BIRD, BEAR, AND SKUNK! ITS RIDICULOUSLY ELON-GATED HEAD RESEMBLES A BIRD'S ! IT HAS THE SKUNK'S COARSE MOP OF A TAIL, WHICH SERVES AS A SUNSHADE BY DAY AND AS A BLANKET BY M.GHT, AND THE POWER-FUL LIMBS AND CLAWS OF A BEAR. IT'S MOUTH IS A MERE KEYHOLE FOR THE EXTRUSION OF ITS ST CKY, WHIPLIKE TONGUE WITH WHICH IT L CKS UP THE ANTS ON WHICH IT PELOS!







THE WINGS OF THE NEW
ZEALAND KIW! ARE SO
RID MENTARY THAT THERE
IS NO DUI WARD SIGN OF
THEM -- THEY'RE AS USELESS AS FLAT FEET TOA
FISH!

IN BRITISH GUIANA, MATURALISTS
HUNT THESE HIGE RUPRESTID
HEETLES WITH TWELVE-GAUGE
SHOTGUNS! THE HIGE BUGS -AS LARGE AS SMALL SAUCERS -ZOOM UP THROUGH THE JUNGLE
TREE-ROOFS LIKE WILD FOWL!

ELECTION TO MODELE THE APPROXIMATION OF THE PROXIMATION OF THE PROXIMA

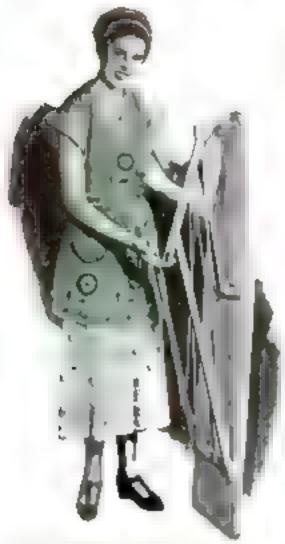
CLEPHANTS COME IN TWO MODELS. THE AFRICAN VARIETY HAS HUGE, FLAPPING EARS I AE BEGONIA LEAVES, AND THREE TOENAILS ON ITS HIND FEET. ASIATIC ELEPHANTS ARE EQUIPPED WITH SMALLER EARS AND GENERALLY HAVE FOUR TOENAILS ON THEIR HIND FEET.

OF COURSE, the title of this page is a contradiction in terms. There can be nothing "unnatural" in nature, Yet, so out-of-the-ordinary and astounding are some of the variations and experiments of Old Mother Nature, that the words seem justified. Nature loves a paradox, and is fond of making birds that act like animals, animals that resemble birds, and fish that appear like anything except a fish.



Inventions

OF THE HOMEMAKER

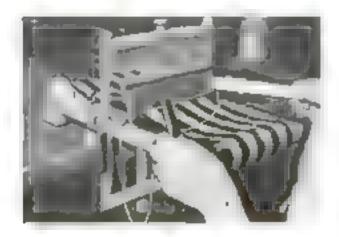


SJEAT DRINGS YORK

A single motion with one hend it sill that is needed to open the fronting table pictured above. When tot up, it stands on three subbar-tipped legs with ample space between for stowing a lage status banket. It folds very compactly



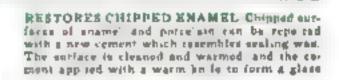
DUSTPAN HAS STORAGE CHAMBER. This dustpan contains a citie chamber in which dust can be enough as it is collected. It is unspired by pulling the chain even in the picture above



FLEXIBLE MOLDING FOR OUTLET WIRES

Additional electric entiers can be provided anywhere by the use of a decorative rubber molding which certies the wires. It is easily to-ctalled being remented to the walls without marring woodwork or breaking plaster.







NICKEL-IRON SKILLET

A new state-reaction carriers containing atchells introduced to the household in the form of a stroy ski let which is said to combine good appearance with best cooking qualities

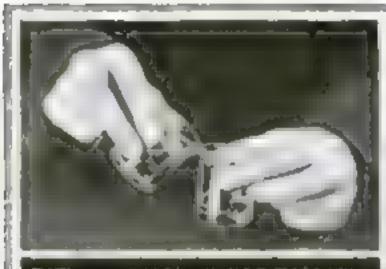
A LOOM FOR THE HOME

Interesting and beautiful (abries can be produced in the home with the simplified loom shows at the left. It clamps to any table. A single needle handles two different colors



The Chemical Triplets

Calcium, Barium, and Strontium





THE HISTORIC MIRACLE OF CALCIUM

Two clear siquide, at top are about to be mined. The crowt seem in the lower picture is a mate of crystale which cannot be poured from the beater

ID you know that you could add to the stock of chemicals on your shelf with the aid of rat posson? Or that, by surprisingly similar reactions, you could prepare a luminous point of a hair remover in your home laboratory. These are some of the interesting experiments to be performed with three closely retated chemical elements—calcium, barium and strontium.

Sulphides of this trio of elements are easy to make, and exhibit odd properties. To prepare calcium sulphide, mix calcium sulphide (ordinary plaster of Paris will do) with charcoal. Place the mixture in a porcelain crucible and heat it with a Bunsen burner. Keep the crucible covered, so that the charcoal will not burn at the expense of the oxygen in the sur rounding sir, but of the oxygen contained in the sulphate. As a result of this "reducing" action of the charcoal, calcium sulphide is left in the crucible after the heating

Take a pinch of the carrier powder von have obtained, and make it into a paste with water. This forms a hydrosulphide capable of destroying certain organic substances. Rubbed on the arm, the paste will remove the hair in only a few

With Compounds of These Elements, the Amateur Can Make Unusual Preparations And Demonstrate Fascinating Phenomena

By RAYMOND B. WAILES

minutes' time. The experiment is perfectly safe, since the action is not escutic Sulphides of barium and strontium, prepared from their respective sulphates in a similar fashion, have the same effect. Commercial de pilatories also employ sulphole preparations of this type. The presence of a sulphide may be demonstrated by adding a drop of an acid, evoking the familiar and disagreeable odor of hydrogen sulphide gas.

Phosphorescence is another characteristic of the sulphidea of calcium, barium, and strontium, and is applied in the manufacture of luminous paints. To show this property, the sulphide must be combined with other ingredients in just the right proportions, and the

task of preparation is usually a delicate one. A simple method, bowever, is to heat a mixture of oyster shells and sul-

phur in a closed container, at a rather high temperature. The resulting mass of impure calcium sulphide should glow in the dark, immediately after being exposed to sunlight.

A currous experiment with calcium, popular among chemists of the seventeenth century, was performed by mixing a strong solution of calcium charide with a strong solution of sodium hydroxide, or lye. The solid lump of white material that formed do not drop out when the vessel was inverted and the uncient experimenters named the picturesque effect "the chemical miracle" You can easily repeat this historic experiment, guarding against failure by taking tare to use concentrated solutions.

The experiment may be varied by dissolving the calcium chloride in alcohol in stead of water. When this alcoholic solution of calcium chloride is added to the strong lye solution, a mass of white precipitate will form as before. Scraped from the container, it can be ignifed, for the product in a form of solidified alcohol.

Because it greedly absorbs moisture from the air calcium chloride in the usual form of anhydrous (dry) lumps should be kept in a tightly stoppered bottle. Its

Rubber Matting Protects Chemical Shelves

Russen matting, used to cover the shelves of your chemical bench, will prevent them from being marred by acids

and other chemical and bottles. The matting may be purchased under the name of running board matecal at automobile acessory supply stores It is very inexpensive, and may readily be cut with an ordinary pair of scissors and fashsoned rate the desired shape and size. These mats also make convenient and ideal coverings when it is necessary to carry on chemical operations, such as fatering and

making up solutions, away from the work beach, it costs but little to have three or four sizes of mats on hand.



The acid-proof matting can be easily cut to 5t

affinity for moisture is made use of to lay dust on dirt roads; the chemical, sifted upon the road surface, forms water films that keep air currents from raising the dust. Calcium chioride is also used as a weed killer, literally dehydrating the roots of weeds.

So closely do barium and strontium resemble calcium in their behavior, that the three might well be termed the chemical triplets. All three, in their pure, metalic form, react even with the surrounding sirand hence cannot be left exposed. They all interact vigorously with water, formsing the hydroxides. Each of the hydroxides, in turn, combines with carbon diaxide to form the carbonate. Chlorides of calcium, baraum, and strontium are all soluble in water; adding sulphuric acid to any one of them yields a white precipetate, the sulphate

Another property shared by calcum barlum, and strontium is their common ability to produce insoluble unalates of the metals, with solutions of soluble oxalates such as sortium oxalate or oxalic acid. Potassium chromate, added to solutions of compounds of any of the three metals, precontates their chromates. Thus if putassium chromate colution is added to calclam chloride solution, calcium chromate

a ye low precipitate, is formed

Knowing these facts, you will often be able to prepare a needed compound of one of these elements when it is lacking in your stock. Even a chunk of rock, or a piece of chalk, may augment your chemical supplies.

Limestone and marbie-the latter a

more or less crystalline mass -are both forms of calcium carbunate; so are pearls, sea coral, and chalk which consists of the shells of minute sea organisms. Still another and purer form of calcouncarbonate la calcite, or Iceland spor; because of its peculiar property of double refraction, you can "see double" through its transparent, glasslike crystais. One proof that all these diverse forms of calc am carbonate have the same chemical compusition is that hydrochioric acid, appared to any one of them, releases carbon dioxide gas, and the substance itself disappears to

form a practically clear solution.

From the carbonates of calcium, barrum, and stroutium, you can easily prepare other compounds of the metals. Calcium chloride for example, may be made by dissolving marble in hydrochlone acid. If the mineral withcrite, a form of barium carbonate, is used instead, barsum chloride is obtained

An amateur chemist may purchase barrum carbonate rather cheaply at drug stores where it is sold for killing rats and mice mixed with flour or other bast it is considered a relatively sale posson. Here is a ready source of barium compounds for home tests. To prepare barrum nitrate, for example add the bar am carbonate to dante miric and coay egual parts of the acid and water) until the effervescence of carbon duraide bubbles ceases. Warm the solution and add more barriers carbonate. If there is no more effervescence, all the acid has been acted upon and used up, and the solution contains the greatest emount of barrum pitrate possible. Filter the sofu-



Barium and prontium produce a brilliant grown and rad light respectively when burned. Luing simple apparatus and tiluminating gas, these effects can be eshibited at home

The transparent substances through which you see the letters as double are crystals of Iceland spar a pure form of colcom carbonate. The phroposenou is called double refraction

> tion and cool the filtrate, and colorless crystals of barrum nitrate will crystalluse out.

Sulphates of calcium, harium or strontium are obtained from any soluble compounds of the metals try adding sulphuric acid or a solution of any soluble sulphate, such as sodium or magnesium sulphate.

Making pure barnim sulphate will give you an interesting acquaintance with the technique of decantation and the washing of precipitates. Start with a hot solution of a barnum chemical, such as the chieride Add sulphuric acid. Wait until the beavy white precipitate settles to the bottom and then add more acid. Continue until no more white precipitate can be seen to form in the clear upper part of the liquid, showing that all the barrier chloride

has been converted into the insoluble barium sulphate

The finely divided precipitate obtained would past right through ordinary filter paper, but it may he recovered by the operation known as decental on. First allow all the precipitate to settle to the bottom of the vessel. Then pour off as much as possible of the clear top liquid (which now consists of excess bydrochloric and sulphuric acids) without stirring up the prec pitate. This is done by allowing the liquid to flow from the edge of the vessel, down a glass rod or tube beld vertical y against it. When the liquid has been drained in this fash on file the vesse again with water. Star-

up the whole contents, let the precipitate settle, and pour off the liquid again. Repeat this a number of times. After about ten such washings, the barium sulphate may be allowed to dry, and is then removed and preserved in a bottle

Alike in most respects, calcium, barium, and strootsum differ atrikingly in one thing -the colors that their compounds impart to a Bunsen flame in which they are praced. Calcium tinges the flame a yellowish red, bazium produces a green color, and strontium a brilliant crimson. You can apply this simple flame test in the home laboratory to determine whether a certain chemical, for example, is a barram or a stroctium compound.

Burning strentium chlorate or barium chlorate in illuminating gas provides a spectacular and beautiful experiment. The only apparatus needed consists of a boile with its bottom (Continued on page 1.4)



A glass rod or tube, held verrically against the ip of the braker makes decanting a liquid easy

Two-Tube Set BUILT WITH SPARE PARTS



A second hand in dget rad o cabinet houses this efficient fittle ruce ver, the chassis being designed with the dimensions of the chasen cabinet is mind

ONSIDERED from any standpoint, this receiver, the "Duo-Duptex," is an excellent about-wave set for the beginner. First of all, it is easy to build second it is meapensive and third it gives splended results on either alternating or direct current and provides louospeaker reception with volume to spare

I s name Duo-Duplex is derived from the fact that the receiver uses only two tubes, and each of these tubes—a 6F7 and a 12A7—is, in reality, two tubes in one. Thus, it is possible to obtain perfectly stable four-tube performance from only two tubes. Not in the least tricky, the connections to each of the tubes are standard in every respect and no complicated reflexing circuit is used.

As the circuit diagram shows, the receiver consists simply of a regeneral ve defector two slages of gardo ampobilished, and a rectifier. The 6F7 tube combines in one envelope a radio-frequency pentode and a troode. These two units are entirely independent of each other except for a common heater and cathode. In this circuit, the pentode section functions as an ex-

ceedingly stable regenerative detector and is coupled through a condenser (C₄) to the triode section, which functions as the first audio stage.

The output of this dual-purpose tube is transformer-coupied to the 12A7 tube, which houses a half-wave rectifier and an audio power pentode in its single glass bulb. Separate connections to the units are brought out to the small, seven-pin base. Two six-volt, 0.3-ampere heaters are connected in series internally; one is for the rectifier, the other for the pentode.

As connected into the circuit the individual heaters of the two tubes are wired in series, thus requiring an overall filament vo tage of approximately mneteen volts and a current drain of 0.3 amperes. This is obtained from the 110-volt power line by means of a built-in-resistance power cord This type of cord contains the usual two wires for the 110-volt power supply and an additional resistor (Re) wire wound over an asbestos core. One end of this resistor is joined to one of the terminals of the plug. while the other end terminates in a timed sleeve that makes soldering into the heater circuit easy. The value of the resistor in this case is 315 ohms.

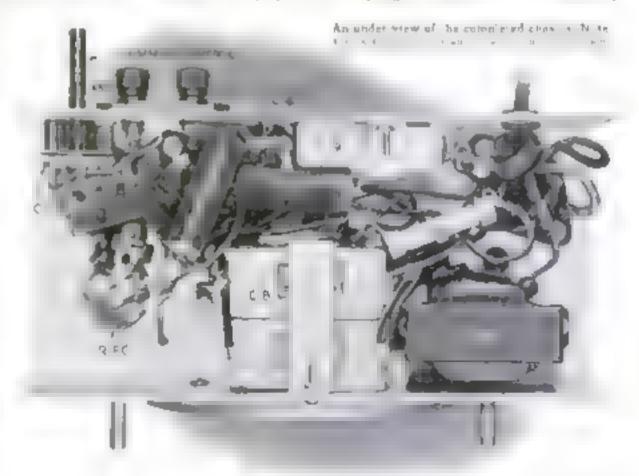
A separate resistor of this value mounted on the receiver chassis may be substituted, if desired, but the special line cord is recommended since the heat dissipated is considerable and, unless plenty of ventilation is provided within the set, trouble will result from deterioration of the fater condensers. For the benefit of those whose power lines may supply 220 or 240 volts, instead of 110, the value of the line-cord resistor in these cases should be 665 and 730 ohms, respectively. These values may be obtained by wiring a 350-ohm or a 415-ohm cord in series with the original 315-ohm cord

Now for the int mate details. In order to make this receiver membersive, as well as easy to build,

the number of parts has been kept to a minimum. Also, various types and brands of parts were tried in the original receiver of see just how much could be salvaged from old receivers, uncompleted circuits, and other odds and ends that gather dust in the radio experimenter's workshop. Parts resurrected from the writer's junk box, veterans of a forgotten age, with values differing as much as twenty persent from the original specific ions, made no appreciable difference in the receiver's performance. If you have on hand any parts that are close to those specified in the list of parts, try them in the circuit before purchasing new ones.

The only critical items in the receiver are the antenna condenser (C₁) and the regeneration (potentiometer) control (R₁). This is not surprising, however, since the antenna condenser determines the degree of antenna coupling, and therefore the amount of energy absorbed from the regenerative detector by the antenna, and the regeneration control provides the means of varying the voltage applied to the acreen grid of the 6F7 tube

The radio-frequency choke (RFC) in the lead from the tickier coil (Lo) to the coupling condenser is a ten millibenry



The pusings-stamp-type antenna tr mover condenses to ina do the chases, with an extension and for adjustment

choke. This may be replaced with a unit of higher inductance, if necessary, providing the distributed capacity is small. Incidentally, a suitable choke can be made in the home radio workshop by winding about 900 turns of No. 34 single, cotton-covered wire in haphasard or scramble fashion on a short section of quarter-inch dowel rod

As can be seen from the photographs, the audio transformer used is of 1924 vintage and is rated as a one inthree step-up unit. Even with this aniednavian reac the quanty was fairly good. Of course, when a more up-to-date transformer was substituted both the quality and volume were improved.

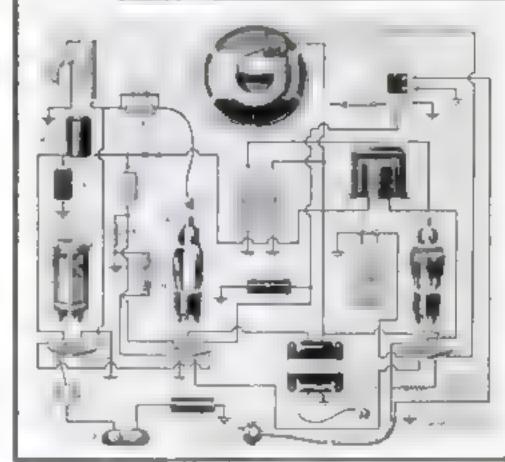
Athough a magnetic speaker is used, a small dynamic unit can be substituted. The field coil of the dynamic then will take the piace of the filter choke (Ch.). The resistance of the choke or the field of the dynamic speaker should be between 300 and 500 ohms. If the resistance is much higher than this, the volume output level will be decreased

For complete success, it is wise to follow the general chassa layout as shown, arthough the actual dimensions will be determined by the size of the cabinet used. After all parts are accurely mounted, the next step as the wring. There are a few points to take into consideration when wiring the receiver if hum is to be kept at a manimum

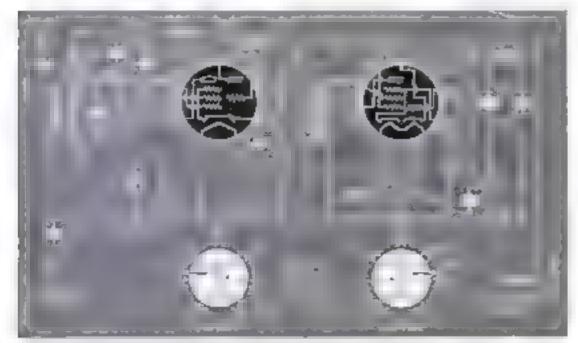
All leads carrying alternating current must be kept as far as possible from all grid leads. It is therefore advisable to piace the heater leads first. They should be run assuand the edges of the chassis to leave room for the more important wires, such as grids, which are connected from point to point and should be as short as possible. Use only a good grade of solder and rosin flux and make sure that all con-

By J. B. CARTER





The small number of parts tegs ted, as above in this picture diagram, makes the set inspensive to build

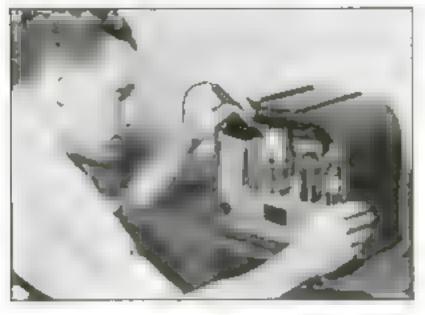


The received consists of a regenerative detector, two stages of godio amplification, and a receiver. Although only two tubes are used, such in in reality two tubes in one

nections are secure. Don't depend entirely on the metal of the chassis for return leads. A separalle wire should supplement the chassis connections to insure low-resistance returns. Also, under no conditions must the chassis be connected directly to an external ground. The ground connection must be made through the fixed condenser Call the receiver is used without the entiret remember to insulate the metal chassis from any possible connection to the ground.

When the wiring is completed, check over the diagram and make sure that no mistake or omissions have been made. Then insert the tubes and one of the plug-in cods, connect the antenna, and plug the line cord into the power-outlet socket. Remember, on a direct-current line, there is a right and a wrong way to insert the plug. If the polarity is reversed, the set will not operate. On an alternating-current line, (Continued on page 119)

Radio Trouble Light Works on 110 Volts



DESEMBLING N pencil, a recently developed midget radio trouble light can be plugged into any 110volt socket, Small enough to fit into crowded corners, the light terminates in an ordinary pilot bulb. A resistance built into the power cord cuts down the 110-volt supply to six volts. The built-inresistance power cord is similar to the one used with the AC-DC receiver detailed on the two preceding pages

Soldering-Iron Rest Holds Flux and Cleaner

COMBINING three items in one, this inexpensive, lightweight soldering-tron rest includes flux and an abrasive, cleaning surface Coiled aprings stretched around the top edges support the from when it is not in use, white two central trays hold the soud flux and the abrasive. An occasional rubbing first on the abrasive surface and then on the flux block not only keeps the tip clean but free from burns and pits.

Condensers

That Stack

EPARTING from

design, a new flat, Tshaped transmitting

condenser permits

stacking to save space

when several units are

the conventional

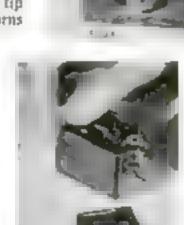


Glass Tubes Have Metal-Tube Bases

TO MAKE them interchangeglass many types of glass tubes are now being provided with the universal-type, "octal" bases

used on the new metal tubes. This allows metal tubes to be used in glass-tube sets and vice versa. It also makes possible the use of the universal eight-bole sockets in

gass-tube circusts. As described last month, all-metal tubes have antional prongs, of the same suce and arranged in the same pattern, which makes it possible to use a single type of sorket for all types of tubes.



to be mounted in a crowded lucation.

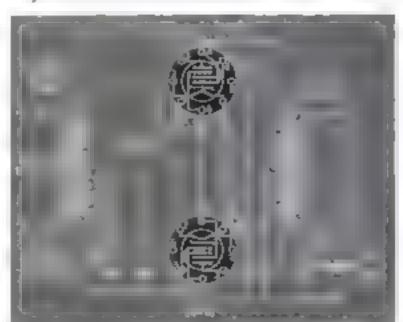
Mounting holes placed to one side of the main body are insulated and independent of the condenser terminals. When stacked, the terminals

are free for individual or group mounting.

New Amplifier Circuit Increases Power of Metal-Tube Receiver

BY MAKING a few simple changes in the wiring of the metal-tube receiver described last month (P.S.M., Oct. '35, p. 52), the more powerful 6F6 all-metal tubes can be substituted for the 6D5 tubes specified. As shown in the diagram, the only changes in the parts, aside from the tubes, involve the output transformer (T3) and an additional fixed resistor, Inplace of an output transformer designed for push-pull '45 tubes, a unit constructed for use with push-pull pentodes (42 s) must be used. The additional resistor a 250-ohm, ten-watt unit is wired into the push-pull circuit as indicated. One other connection, involving the new pentode push-pull transformer consists of connecting the center tap to the interconnected grids of the amplifier tubes. Since all

metal tubes employ the same type of socket, an eight-hole unit, no physical changes in sockets need be made. However, since the 6F6 tubes are pentodes and not triodes, the additional connections shown must be made to the sockets. The radio-frequency and detector circuits of the receives remain the same. Since the new 6F6 all-metal tubes are eguivalent to the old '42 glass tubes, a notrecable increase in volume will be obtained by this arrangement. Incidentally, the 6F6 tube is used in preference to the 6D5 in receivers of commercial design.



Compact Power Filter

COMPACT and mespensive, the powerline filter illustrated can be installed directly at the wall socket that supplies the power for your radio receiver. Provided with plug prongs and standard receptacle boles, it is simply plugged into the wall plate and the power cord from the receiver is in turn plugged into it. One of the wall-plate screws not only serves to hold the unit in place but also provides the necessary ground connection. Once in place, it eliminates any man-made static that would otherwise enter your receiver circuit through the power lines

Plugs Into Wall Plate

Storing Radio Tools

Matas fishing-tackle boxes make excellent radio-tool kits. They have a long compartment that will take a soldering iron, while the divided trays provide storage bins for small parts.

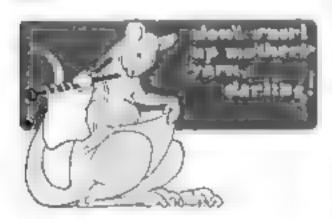
Is the solar day the most accurate measureuestion: ment of time?—A.O.T., Washington, D.C.



A .- ruz must accurately timed day is the sidereal or star day. The length of such a day is determined by the interval between two successive appearances of a fixed star on any chosen menduan. It is about four minutes shorter than the mean solar day so that there are approximately 366 sidereal days in a year of 305 solar days.

To Keep You Well

P. M. S., glizabeth, M. J. There are, in round numbers, 150,000 physicians, 01,000 dentists, and 20,000 drug stores in the United



A Puny Start

Q.—m It true that a kangaroo is as small as a mouse when it is born?—C. B. L. Sacramento, Calif.

A .- KANDARDOS are less than an inch long when born. They are blind and without fur. Usually only one kangaroo is born at a time. The mother's pouch affords the young its needed protection.

Can't See Undersea

P T., WATERBURY, DAY The normal human eye, developed for vision in the air, becomes a poor optical instrument under water because the contact of the water with the cornes, he transparent part of the eyeball cov-ering the pupil and iris, robe it of about two thirds of its refracting power

It's a Good Wind

S. H., BAVANNAH, GA. The Leade winds cover about one twentieth of the earth's nurface These regularly flowing masses of air, moving from the tropical areas of relatively high pressure to the equatorial belt of low pressure, form a current about 1,000 miles wide and extend for a distance of 2,000 miles. In the Northern Hemisphere these winds blow toward the equator from the Northeast and in the Southern Hemisphere from the Southeast.

Setting the World's Clacks

Q william was a world standard of time agreed upon? Also when was it leess sed for use in this country?-C. W., Columbia, S. C. A.-a women standard of time was adopted

at an international congress held at Washington, D. C., in 1884 Standard time was maugurated in this country in March of the same year and came into use without any legislative action

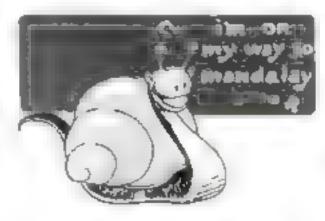
A Case of Fish Eat Fish

O. M. T., HAVERSTELL, MASS. The brezest loss of trout in stocked streams is not due to fisheating birds but to other fish such as sticklebacks, sculpins, suckers, sunfish, catfish, and even trout themselves. There is also a heavy loss of trout fry from water stakes, salamandem, crawfish, leeches, and larvag of certain

To Restore Faded Writing

Q.—r MAYE an old manuscript on which (be writing has faded so that it is no longer legible, is there any way in which I can restore the writing?—N. S., Richmond, Va.

A .- Title fieled writing may be restored by robbing the manuscript with a solution of animonium sulphide or hydrogen sulphide. The resturation is not permanent but the writing ran be traced with India ink to make it so. This procedure will not be effective if the original writing has been done with an aniline



At Home Anywhere

Q .- what animal is found over the greatest range of the world's areas?—H. N., Racine,

A .- reconstruy no other living animal has a wider range of habitat than the snail Snails are found above the snow line in the Himalays Mountains and at all intermediate afti-tudes down to sea level. Apparently not content with this land record, they have invaded the sea and specimens have been brought up from a depth of 10,000 feet below the surface of the ocean.

Cleaner for Wall Paper

Q .- in your country, you have some excellent walt-paper cleaners. Would you be so free as to tell me how to make such a cleaner?

H N. Odense, Denmark.

A. A WALL-PAPER thrange may be made as follows. Mix into a dough one pound each of rye flour and white floor. Bake partially and remove the crust. To this mass, add one ounce of common salt and one-half nunce of powdered raphthalene. Mix and add one outre of corn meal and one-righth ownre of burnt timber After the doughble substance has been thoroughly mused a mass of the proper size to be grasped in the hand should be drawn across the surface to be cleaned, in one direction only.



The Hard Part Is To Find It

Q -wunt metals are found in an uncomlined state?-J. H. H., Denver, Colo.

A -- coto and platicum share the distinction of being the only metals customarily found in nature in the uncombined state. Only a few other metals, such as silver and copper, and these rarely, are found in the free metallic state. Gold, on the other hand, is selders found in any other form

A Lot of Hellos

P. W., sources, scass. It is estimated that more than 75,000,000 telephone convenations take place daily in this country. This is at the rate of nearly 900 for every second.

Some Long-Lived Birds

C. A. A., HARRISOURO, PA. The maximum ages attained by some long-lived common treatures are, awan, 150 years; golden cagle, 104 years, zaven, 100 years; parrol, 100 years, goose, eighty years; sparrow, forty years. The average life span, of course, is somewhat less in each care

Rivers' Tribute to Atlantic

Q-can you tell me the volume of water that rivers empty into the Atlantic Ocean each year?-O. M. R., Scattle, Wash

A -- it is estimated that the yearly dis-3,400 cubic miles of water-equal to about one half the river discharge of the world.

Biggest in the Air

Q .- what is the largest species of water birds?-- J. J. A., Portland, Muine.

A -1 HE wandering albatross is the largest of all water birds It has, in fact the largest wing expanse of the entire bird kingdommeasuring ten to fourteen feet, tip to tip. The bied is noted for its extended flight. It actually lives on the wing, alighting on the water only to catch a fish or pick up a piece of refuse from a ship. When the bird takes to flight from the water, (Continued on page 1.7)



Gus says: Quit Your Skidding

OU may have been beautiful on a tree, but you're only a danged nuisance now," muttered Gus Wason veteran mechanic of the Model Garage, as he vigorously wielded a broom on a layer of damp leaves stuck to the concrete in front of the gas pump.

"Morning, Joe," he called to his partner, as the latter arrived with his lunch kit swinging at the end of his skinny arm "Better dump a quart of oil in the service car and see that there's gas in the tank With the ground covered with leaves, and that run last night, I have a bunch we're going to get some calls today "

'What have the leaves and the rain got to do with service calls? Joe asked. It's

all dried up now anybow

"Come out with me on the first call we get and you'll see," repried Gus, no he went on with his sweeping

Before an hour had passed, the phone bell shriked and Joe popped out of his

little office

"You win Gus' Let's go he called as he combed into the service car and mofloried to the boy to swing the doors open.

"Drive down Center Street till you come to the bend just beyond Locust Avenue," Jue directed, as Gus piloted the service car out into the street, "Mrs. Dean phoned she's barged right off the pavement onto somebody's yard—says the steering gear's gone haywire. Nobody's burt she says."

"Maybe it is the steering grar, but I'll bet you a cookie it isn't," said Gus. When the garagemen arrived on the

By MARTIN BUNN

scene, Mrs. Dean, pale and trembling, was staring fixedly at the front wheels of the car Oh Mr Wison! Can you fix it right away " she gasped, as Gus climbed out of the service car "Mr Dean will be so angry with me if he finds out I've had an arcident. You know I haven't been driving long."

"Don't worry, Mrs. Dean. We'll take care of things," Gus assured her, as he walked beck up the road and entically examined the tracks the wheels had made

in going off the road

What did I tell you, Joe!" demanded Gus, pointing to where the tell-tale slidnig streak of the tire started on a part of the road that was covered with wet leaves

'Did you put on the brakes as you came down the gtade here, Mrs. Dean?" be asked.

"Only the timest little bit," she replied. "I wasn't going fast, and I wouldn't have put on the brakes at all only I was going to stop at Mrs. Foster's, three houses farther on."

That's funny," said Gus. shouldn't have gone into such a bad skid unless something is hinding on that wheel.

I'll take a look.

Gus got out the jack and a wide piece of board to keep it from sinking into the soft turf. As soon as the tire was clear of the ground, he grabbed the wheel and gave it a vigorous twist. It turned

stiffly with a rumbling, grating found. Humph." Gus grunted. Roller bearing broke—doesn't happen often these days. Drive down to the shop, Joe, and get a new set while I take these out.

"Then it wasn't the steering gear, after all " exclaimed Mrs. Dean, "And it wasn't even my fault, was it, Mr. Wilson? Surely I'm not to blame if that roller

thing builted, am I-

Gus laughed. "Not directly, Mrs. Dean, But you wouldn't have landed on this lown if you hadn't put the broke on just when you did. Probably you didn't know that a coating of wet leaves on a road is pretty near as treacherous as a sheet of ice. And you're most likely to get into trouble on a day like this, when everything looks perfectly dry. It rained last right and, although the top leaves are dry, they're wet and slimy underneath. The tire sticks to the top leaves all right, but the wet, slippery ones beneath act like a rug on a polished floor. Putting on the brake, even just a little, sterted the slide because of that stiff bearing, but even if the bearing had been O.K., you'd have landed here just the same if you'd been going a bit faster and put on the brake a bit barder '

"The mere thought of skidding makes me feel faint and shaky," said Mrs. Dean. "This is the second one I've had. You feel so absolutely helpless when the car starts to slide and you can't stop it. And there doesn't seem to be any way of learning what to do about it." (Continued on page 118)

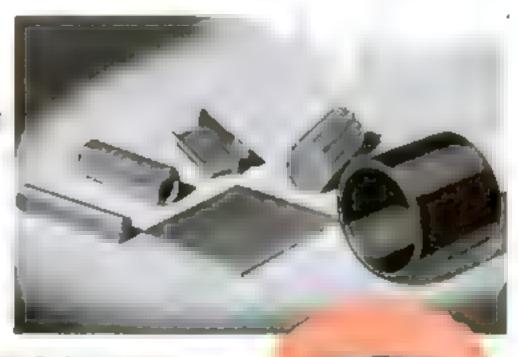
THE HOME

WORKSHOP

HOW TO WORK WITH

Cast Resins...

A marvelous new material for amateur handicraft



Bawing may be done to the high parties and the stock will cut as easily as medium hard woods

AST synthetic resins are those brilliantly colored, jewel-like materials used for making costume jewelry, table lamps, clock cases, game sets, and hundreds of other items in which color, translacence, fine permanent finish, and ease of working are important Unlike most synthetic plastics, they can be machined in the home workshop, requiring only ordinary skill and the familiar tools used to work hard woods or light metals.

In the hands of the clever home craftsman, they offer unusual opportunities to produce beautiful objects—far more colorful and enduring than most woods, far more appealing to see and touch than cold metal. Until recently their purchase was restricted to manufacturers only, but today a number of firms are in a position to supply the home shop owner with either work kits or single castings.

Cast resin materials are made in glant kettles as a liquid resin and are then cast in lead molds and placed in vulcanizing ovens to harden. When ejected from the molds, they appear in the form of rods tubes, sheets, or any of several hundred special shapes. Thus there is very little waste in machining; the craftsman merely chooses the particular casting which most nearly conforms to the shape he intends to develop.

Choice of type and color is also extremely wide. Castings are made in solid colors, in mottles like marble, in light transfuced shades, and in completely transparent, water-clear form. Transparent castings

Typical resto castings. The flat plate is a piece of 4th about stock. The others from africal right are surf nd ring pin note the Beautic shapes, lancy dress-clip the bracelet austerial

are sometimes flaked with tinsel in gold of silver. More than 300 shades and colors are manufactured, though not all of these are available to the amateur craftsman

In working cast resens, almost every process possible with wood or brass is equally easy to apply

Pan shed braceles and clip These are the same pieces in lawy photos. The brace of has been left half carved to show the difference between the smeath and decetated puriscess

You Can Learn Quickly
to Use Plastics by
Making a Few Rings,
Pins, Dress Clips, and
Bracelets with Ordinary
Tools—Many Colorful
Projects Are Possible

By ALBERT Q. MAISEL

They may be sawed, drilled, threaded, carved, sanded, ground, turned, poished, and cemented. In most cases the process compares exactly with that used in working hard woods. In some instances slight differences obtain. Probably the easiest way to learn how to work cast resins is to follow the process of making one or two pieces of costume jewelry, for jewelry calls for the use of almost every operation mentioned.

One of the accompanying photographs shows several jewelry castings. The large cylinder is a bracelet section, ample for making from three to six bracelets. It is cast so as to be of a size that will slip readily over the average woman's hand.

The first operation calls for sawing off a section to the required width, which will vary, with your design, from 1/2 in, to as much as 1/2 in. If a back saw is used, apply only light pressure, to let the powdered chaps clear. Place a block of wood within the cylinder when locking it in a vise, so that it won't break or crack under the pressure. If a band saw is available, the cut may be made in a few seconds. The saw should not run faster than 280 ft. a minute, to insure against acorching. If the work is pushed slowly past the blade, a neat, almost polished cut will be secured.

Having cut the section, place it on the expanding jaws of a chuck for turning If no such chuck is available turn a wood block to a slight taper, so that the section will slip over it to a tight fit. Lock this block between centers on the lathe, with the cast-resin section in place, and use an ordinary wood-turning chisel, taking a light bite. Hold the chisel edge at or slightly below center, but have the handle higher, as illustrated. The material will machine with a shaving, instead of crumbling like wood.

Some craftimen who have been working with this type of material prefer to grind their chisels with a bevel on both sides, and if you wish, you may grind a chisel or an old file to that way and experiment for yourself. Start turning with the handle raised well above the cutting edge, and lower it by degrees until you find the angle that gives the best shaving.

The bracelet is now ready for curving This is done with a regular beach spindle attached to the power end of your lathe or to any rigid revolving head. Old denlists' drills and cutting wheels or burs can be used if the proper carving tools are unavailable. Professional carvers work from memory, centering their designs by eye. The amateur will do well, however, to sketch his design on the turned bracelet in pencil before carving. Carve the deeper cuts first, then the shallower ones. Take care not to make your cuts too deep or you will weaken the piece and possibly fracture it. After carving, wash the dust away in cold or lukewarm water, using an old Lootharush to clear the crevices.

There are two steps to the polishing process first asking or pumice polishing, and second, waxing. If you have a 6-in, buffing wheel of the muslin-disk type, operate it at a speed of about 3,000 r.p.m. If your wheel is larger or smaller, adjust the speed to compensate accordingly,

In ashing or preliminary polishing, place powdered pumice and water in a shallow panunder the buff so that the wheel just touches the mixture. As you hold the piece to be polished against the wheel, apply some of the "mud" by hand just above the piece, doing this as often as necessary

Final or wax polishing is done with a similar wheel, using standard waxing compounds or a better grade of powdered floor wax. After polishing, finish off with a soft, dry butting

To make a ring, follow the same processes as in the case of the bracelet, Ring rods

(such as the second from the left in the photograph of the raw materials) are cast with a center or finger bule having a slight taper. Thus a 6-m, rod will provide about twelve maps having finger holes of various sizes to fit varying hands.

After sawing off the ring section, place it in a vise with the flat face downward, and cut back on either side with a back saw so that the band between and in back

WHAT YOU SHOULD KNOW ABOUT Cast Resins

THE MATERIAL. Synthetic resins are cast into rods, tubes, sheets, ring stock, bracelet stock, and several hundred special shapes. They are available in all solid colors, light translucent shades, water clear like glass, and in an endiess variety of mottles.

PROJECTS. Costume jewelry, table lamps, clock cases, game sets, book ends, novelty boxes, candlesticks, salt and pepper shakers, jewel cases, trays, photo frames, coasters, handles and ornaments for furniture, desk sets, and innumerable novelties.

OPERATIONS. The material may be sawed, drilled, turned, threaded, carved, sanded, ground, polished, and cemented.

Tools, Lathe, jig saw, grinder, polishing head, carving spindle, back saw, files, and other tools ordinarily used for hard wood or soft metal.



The grabous consumption of the c







Here are a few of the thousands of designs that may be made from simple rests care age. With this material year can work out counties ideas

of the fingers will be thinner than the carved face. Then carve, wash, poush and

Clips and pins may be made in two ways. A number of shapes are available in standard roditive sections. These may be sawn off to the desired thickness and then beveled on a sanding belt, a granting wheel, or with sam paper and subsequent vicarved and polished. It, however, a special shape is desired, sketch it in outline on a piece of paper, paste this on a section of sheet stock—usually ½ in thick—and then cut it out on a jig saw. Either a hand fret saw or a power scroll saw can be used. After this, follow the practice previously outlined.

In making earrings it is best to place the round earring rod in a lathe chuck and turn its end to the desired shape before cutting it away from the excess rod. This is necessary because of the small size of the stock.

On pins, clips, and earnings, it is necessary to attach metal parts called "findings." These are of standard types and can be purchased from jewelers or suppliers of cast resins, or may be taken from cheap, dime-store jeweley

The riveted kind require drilling with a fine drill and the insertion of small self-tapping acrews to attach the finding to the cast resin. The simpler pressed in type can be attached in one or two minutes by the following method: Turn an electric iron over to form a flat, hot table. Heat the back surface of the pin, clip, or earning sufficiently to soften it by holding it against the iron, but take care against

overheating, which will spoil the coloring. A heat of about 230 deg. F. is ample. When the piece is softened slightly, the attachment pins of the finding can be forced into the cast resun by applying slow and steady pressure, If no better tools are available, place the two parts in a vise and tighten slowly. Do not hammer the pins into place; a strong hammer stroke may deform the softeped result.

When the finding has been forced into place, the cooling resin will contract over the pins, and a tight and permanent bond will be secured.

Many other types of jewelry may be made by the ingenious craftsman. A study of the designs on display in department stores will suggest many ideas. Link bracelets can be

made by cutting the links from two colors of rod stock, drilling these, and then threading them with elastic cord.

Two-color clips can be made by carving or cutting sections to an exact fit and then cementing them in place. Cast-resin dealers supply special cements for this purpose, as it is difficult to stack these materials together securely with any of the adhesives ordinarily used in the home workshop. It pays to obtain the special cement recommended by the manufacturer of whatever make of plastic you happen to be using, For temporary attachment, however, as when fastening a sheet or block of the material to a piece of wood so that it may be acrewed to a faceplace without leaving boles in the cast resin, liquid or hide glue may be used. It will not be difficult to remove the material afterwards and wash off any remaining glue,

If transparent, water-clear resins are used—they cost about twenty percent more than the colored types—they can be carved from the back and painted with water colors to give flower or other designs.

A second color may be added to frontcarved colored pieces by using sharp and comparatively shallow carving and then, after pumicing, applying a thick film of water color. This should be followed, after the color is fairly dry, by a light dry buffing, which will remove the color from the surfaces and leave it only in the carved grooves.

If you would like to see more articles on east-ressn craftwork published in future itsness of Populan Science Monthly, please send a post card to the Home Workshop Department. Bear in mind that this type of modern plantic is not the same as celluloid, similar as the materials are in general appearance. A number of articles have already been published on celluloid work (see P.S.M., Jan. and Oct. '11, Mar., May, June, Sept., and Oct. '35).

Was polishing a carved clip, Here again, the higher the speed, the better the polishing. This is followed by a about dry polishing



Tara court as a k





SPECIAL DRAWER BUILT INTO BASE OF DRILL

When setting up a sensitive dril I built a wooden base with a drawer to hold an assortment of drills from 1/16 to 34 in, by sixteenths, as well as three sizes of center drills. The bottom of the drawer has a shallow groove for each size drill to rest in.—T. O.

CEMENT CLEANS OILY FLOOR

AFTER some heavy machinery had been moved in a large pumping plant, it was found that the concrete floor beneath was bodly stained from drippings of oil and grease. Several methods of cleaning failed, and a suggestion was finally made that ordinary cement be spread over the soiled section. This was done, the powder being sprinkled over the surface only in sufficient quantity to cover it well. Every other day for a week it was stirred up with a brush.—Neaton Barrett.

Left-over pieces of beautiful hardwoods provide the material for this unique container

ROM a few scraps of fancy bardwoods

you can make the attractive little cig-

arctle holder shown above. First construct

the two containers, open at top and bot-

tom, of 3/16-in, basswood plywood. Rab-

bet the corners and set in the 1/4-in, square

walnut pieces, letting them project 1/16

in. Glue on the mays, top and bottom:

then the satinwood sides, which are 1/20-

in, thick veneers. The rim on the base di-

TOOL TRAY SWINGS OUT OVER BENCH

DRILLS, files, and measuring and lay-out tools, which are in constant use, may be reached more conveniently if kept in a tray that swings forward over the beach as illustrated.

When work is to be done, the tray is pulled out of the cabinet and swing forward and downward to a stop. The pivoted drill holder is then turned so the holes face apward, and the various punches, scribers, and similar tools are set in their holes ready for use. At the conclusion of work, the drill holder is swing down, and the small tools are laid in their special tray. Then the main tray is pushed back

into the space at the top of the lower shelf compartment, which usually is not occupied by anything in the average tool cabinet.

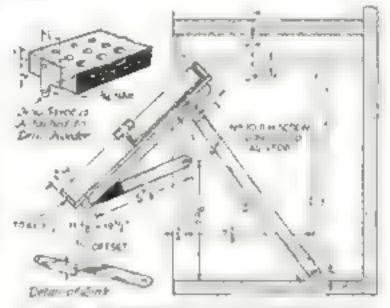


The truy or pushed out of the tool cab not so that it reats at an angle, with driles and other small tools readily accessible

The tray can be designed to suit the space available. The one illustrated required the todowing majeria's Wood—1 pc. 14 by 1114 by 1914 in for base; 2 pc.

2 pc. 1/2 by 19/2 ln. for aides; 2 pc. 1/2 by 11/2 by 10/4 ln. for sides; 1/2 by 1-in. partitions as desired, or cigar boxes, 2 braces 1/2 by 1/4 by 10/2; 1 pc. 1/2 by 6 in. for drill holder Steel—2 pc. 1/16 by 1/2 by 6 in. (with 1/2-in. offset) for links; 2 pc. 1/16 by 1/2 by 13/4 in. for drill-holder plates; 1 pc 1/3/2 by 1/2 b

To serve as the main tray pivots, eight 1/2-in. No. 8 round-brad wood screws are needed, for stops, two 3/2-in. No. 8 roundhead screws; and for drill-holder pivots, two 3/2-in. nails.—W. Heinemann.



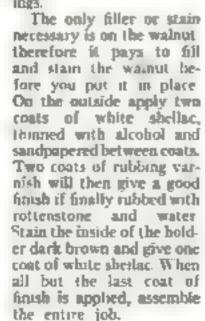
How the tray is pivoted and a detail of the drill holder, which turns down so that the tray can be pushed outs place

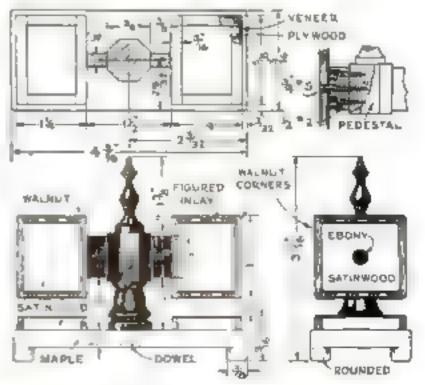
CIGARETTE HOLDER MADE FROM SCRAP WOOD

Turn the pedestal from ebony and shape the octagonal part by hand. The base in this instance happens to be a piece of freak maple found in an ordinary cake board that cost ten cents.

The remaining details and method of assembly are made clear in the drawings.

The reason there is a gap between the bolder and the rim is to give the design distinction and make it easier to clean off the tobacco that collects from the eiger-ettes.—Thomas B. Owens,





6.1



HE "eye appeal" of this Early American maple love seat depends on its outline, structural details, and finish. Its comfort is due to the modern inner-spring sent cushions and stuffed back cushions and the currect proportion of the sest and back angles. The straight lines and squareness of its design are softened by rounding off all sharp corners and edges.

Its construction does not demand exreptional skill nor extensive tool equipment; the prime requisite is care—care in selecting well-seasoned maple of uniform light color, care in making all joints accurately, care in planing, scraping and sanding the surface, and care and patience

in firmiting.

The following order of procedure is suggested. The dimensions marked "approximate" on the drawings should be checked during assembly, as they may vary because of alight differences in fitting the leg and back joints in the sest

1 Cut and fit the seat frame

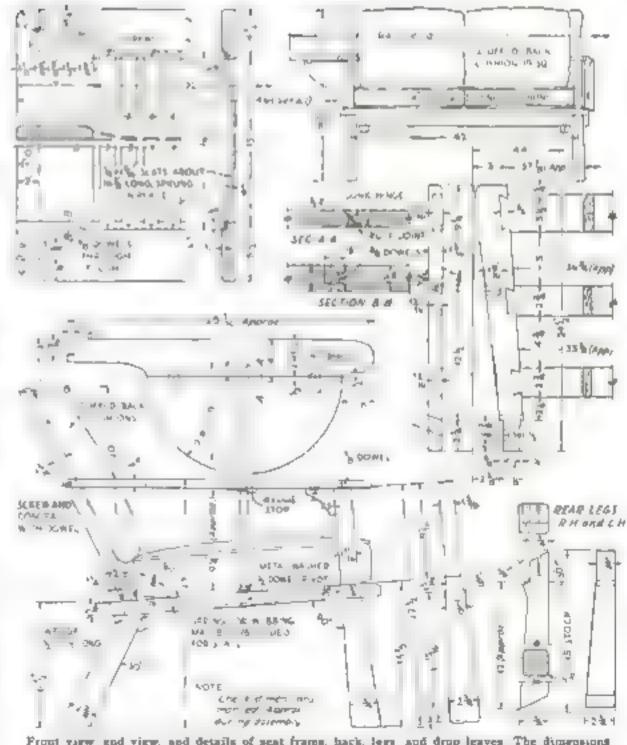
2. Cut holes for legs and back post in the sent-frame members before assembling. as they may be more easily handled sepa-rately. This may be done by hand chisel or on drill press with router lat. If on the latter, the corners of rear boles may be left round and the fit ing parts rounded to fit

3. Glue seat, peg the joints, and surface

with place and scraper

4. Cut out legs; shape with file, plane, and scraper, and fit accurately to holes in

5. With legs fitted in place, block up sent on a level bench so that the top front edge is elevated 151/2 in, and rear top edge 131/2 in., as shown in one of the allustrations. Scribe a time 2 in, from the beach ton around each leg. A surface gauge is handy for this purpose. Remove legs and cut them off on the scribed line. Later cut off upper end (Continued on page 81)



Front view and view, and details of seat from a back, legs and drop leaves. The dimensions are suntable for standard 21 in equare seas cushions, but may be medified to take other sizes

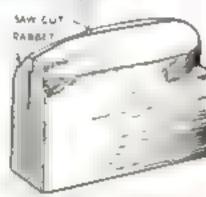
MY METHODS Realistic Small



boats add such a pleasing and interesting linishing touch to a ship model that it is a pity more trouble is not taken to make them correctly. One so often seen an otherwise fine model with impossibly shaped or carelessly made boats.

McCann

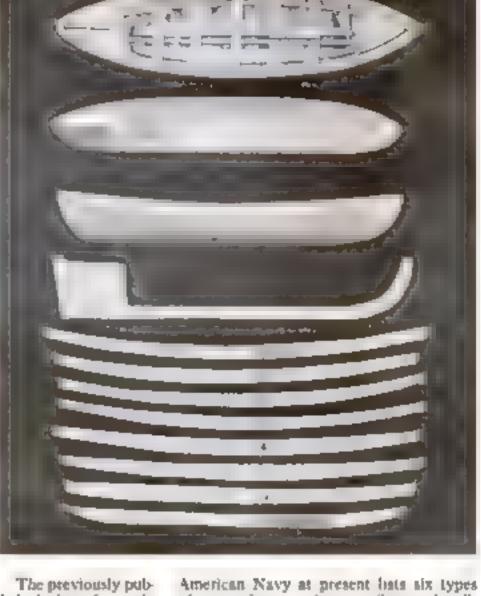
The methods to be described will work well from, say, a 1/16-in, to a 3/16-in scale; smaller boats will need less, and larger will need more, detail than shown



Stold or form used for making a boat from its n cardboard by first method given in the cent

The previously published plans for making the US Martines (PS M., Jan - May, '34) gave the lines of three boats suitable for a ship of her style and period and are the examples I have de-

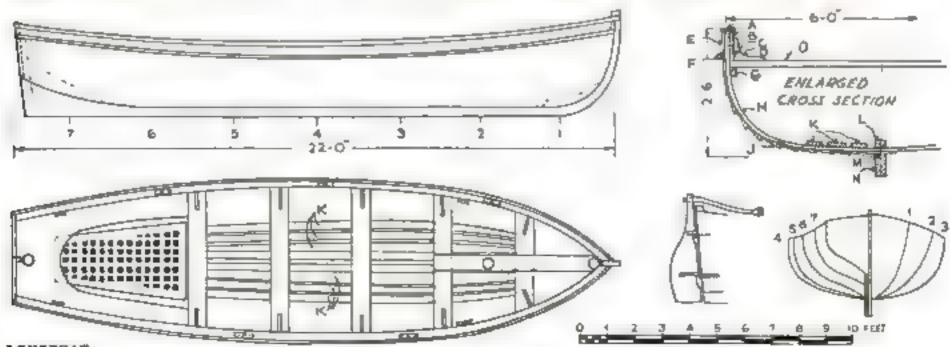
veloped for this article. They would be sufficiently correct for similar vessels from the middle of the eighteenth century to the present day. Navies had, and have, of course, many other shapes and sizes; the



American Navy at present buts six types of power boats and nine sailing and pulling boats, varying from a 50-ft, steamer to a 12-ft, wherey

For merchant vessels the question of boats is easier. For well over a bundred years they have carried, almost exclusively, double-ended lifeboats, longboats or work boats, and gigs or danghies. Accurate lines are given for the first two of these from which, by altering the scale, any clipper shep's boats can be made

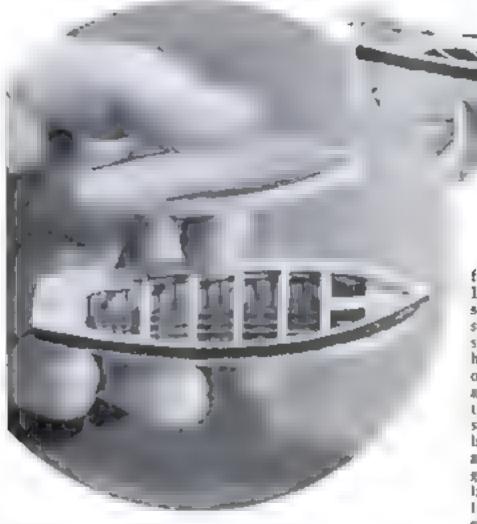
On the various Popular Science Monthly supposed Lagrants will be



LONGBOAT

A cap, B ganwale, C shock, D have, E sheer strake, P rubber, G sizer, H frame, f plants, R footings, L busines, H bog piece, H keel, D theory.

Boats for Ship Models



The 26-ft netter and 32-ft launch of the Harriard The first to made of wood in two heires, the second of overlapped cardboard prants."

20-0

found the lines of boots suitable for their respective ships.

I have found that the method which gives the best boat is little, if any harder than supposedly simpler ways of making a boat not quite so good. I shall therefore describe how I made the 33-ft launch and other boats like it for the Hartford.

Take a piece of white pine the length and breadth of the required hoat and about 3 in, deep. Whittle the top of this to the shape of the boat, but let it be enough smaller to allow of a double thickness of "planks." This is the moli or form. Set it in the vise and make a small saw cut at both ends. From the plan, cut a stem, stempost, keel and deadwood (if any) in one piece. The thickness should be about 1/32 in, and the depth, to start with, about 1/3 in, with a little extra at the fore-

foot and at the stern. If the boat is to be square sterned, the sterapost will be inside the lines and will have a rabbet cut out of it to the thickness and depth of the flat transom. As the best shape for this backbone is rather tricky. a drawing of it is given. I found fiber board the best material, but metal or even Bristol board would do. If metal is used, bave the center part of the keel only

the depth of the keel. The entra allowance in the other material is merely to give it strength while building and is to be cut off the finished boat before it is removed from the mold.

Thoroughly wax the mold to prevent glue from sticking Set the stem and stern in the slots—an easy but not wabbly fit Nail a thin wooden transom across the stern of the mold to fit in the rabbet made in the sternpost; make it a shade large and file the edges to follow the bines of the sides of the mold,

Now we are going to form the boat with cardboard planks gued together. Boats are most frequently made with their garboard strakes (lowest planks) nailed to a hog piece, which is a flat plank nailed on the keel, inside. This plan suits us best, so we make a curved overn like a double

plank, give it on top, slip it under the keel and press the latter down

A large, detailed model of a ship's best makes a good ornament in itself

Mark the height of the gunwaie on the mold. Take a slep of paper and measure from the keel to gunwale amidships and near the ends. Mark these positions on the mold. Divide these lengths into the number of planks you are going to give the boat A 33-ft boat would have about 19 planks, but 9 or 10 will look right on a 14-in scale model These positions will be the lower edges of each plank from the keel,

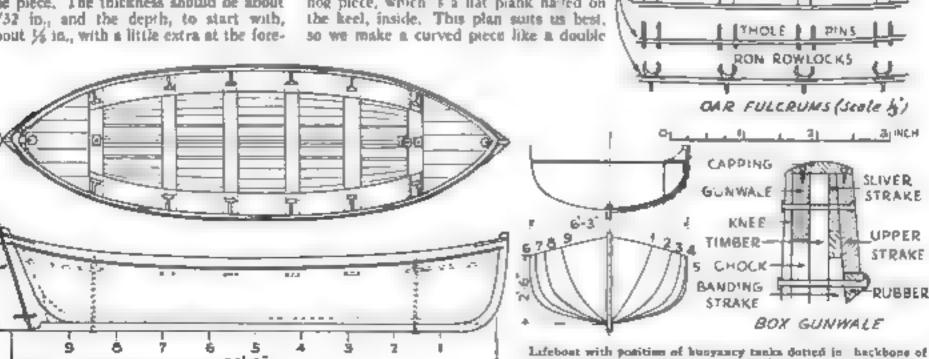
Index cards do nicely for planks, although I have also used three-ply board. which is very tough but a bit thick. The first plank must be cut so that its edge ites along the keel and runs up onto the stem and stem. Its shape, and those of the other planks, will be more or less as shown for the whaleboat, Each plank most lie quate flat on the moid and be cut, not twisted, to lie in place, I gut the planks about twice the width that will show amidships and apout one and a by I mes the width at the ends, so as to have something to glue to. Glue this first plank to the hog piece and the keel, but not to the mold. With your paper scale mark where the lower edge of the (Continued on page 92)

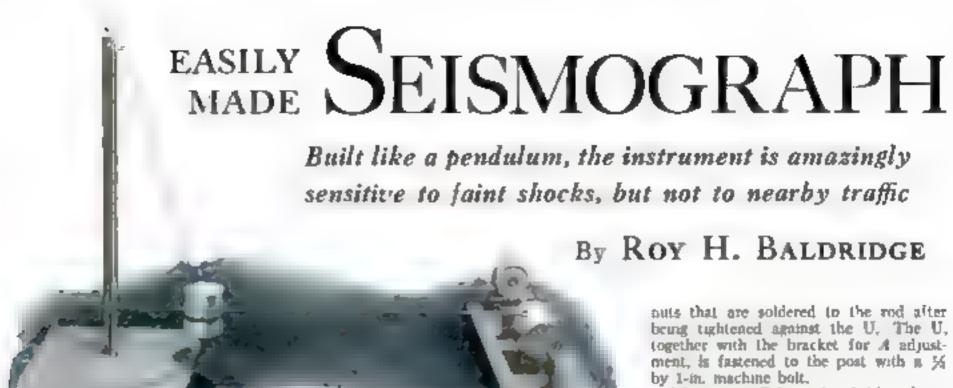
PATTERN FOR BACKBONE

the model of the Hartford's launch, our falcrums, and ben gunwale

GUNWALES

OF 33 FT LAUNCH (Scale &)





Complete aviamingraph and recorder. Earthquakes from 200 to 0,100 miles away have been registered.

HIS very instant the ground trembus beneath your feet. The earth's crust, seemingly, is never at rest and somewhere in the world, perhaps in the center of a continent, possibly beneath some ocean, a quake is in action that may send its vibrations around the globe. For sheer unbelievable, horror-tinged experience, with the terror of a nightmare imposed on reality, there is nothing quite like a stiff earth shock. To the accompaniment of tow-pitched rumbling, the ground writhes, crees away, and buildings crash, while the sickening realization comes that there is no rigid thing left to which you can cling for support,

No use knows when or where an earthquake will occur. For this reason scientists are studying earth movements, and have learned much of the nature of such disturbances, as well as what can be done to

lessen damage from them.

By huilding a seismograph similar to the one illustrated, you can make a hobby of quake recording yourself. You may have to wait only a few hours after completing it to check up on a shock, and at most only a few days will elapse. My seismograph has recorded forty-three earthquakes within six months, varying in distance from 200 to 6.100 mues. Although it is located within 75 ft. of beavy street traffic, no bad effects are noticeable

This instrument consists of a horizontal pendaram suspended by a fine wire from an upright post in a heavy foundation. When the earth trembles, the bob, freely suspended, remains almost still while the post and pivot vibrate. A delicate point at the end of a long, light arm fixed to the bob magnifies the movement of the ground and acratches the record of it up a smoked paper wrapped around a revolv-

ang drum.

The post is an angle iron drilled as detailed in the drawing. Set it up in a concrete foundation about 16 in. square and 9 in, high, or a shell of bricks may be built up, and concrete poured in the center. While this hardens, make the other parts.

The bob, or weight, is of lead, melted and poured into a can about 3 by 31/2 in. The dimensions may vary somewhat. If the can is packed in damp sand, the bot metal will not run out when the scams

In the center of the side of the weight, drill and top a 1/2-in. hole, 1/4 in. deep. Thread a 1/4 in. brass rod 5 in. long at one end to screw into the bob, and if it is too loose, make a few dents in the lead. Cut off the end of the rod so that the distance to the center of the weight is 5 % in., and drill a hole in the end slightly larger than an extra-loud phonograph needle, of such depth that the inserted needle will be emetly 6 in. from the point to the bob center. A little solder rocked into the bole around the needle will

In the center of each side of the weight, at right angles to the rod, drive a small finishing nail, allowing the bead to project about 1/4 in. Attach a sturnin of No. 14 or 16-gauge from wire to these nails with loops, and tie the suspension wire to the center, thus bringing the point of suspension to the center of the bob.

Three adjustment points are provided in the seismograph. The upper, or wire adjustment (A in the diagram) consusts of a threaded brass rod bent L-shaped

and pierced with a small hole. It is screwed into a bracket consisting of a brass plate with the upper end bent back at a little more than 45 deg. A lock nut behand the bracket keeps the adjustment tod from changing posi-

Adjustment B, for shifting the upper support sidewise is a piece of by by by m. brass bent U shaped, with a 3/16-in. threaded brass rod running through the ends. The U is not threaded, serving merely as a bearing for the rod, which is kept from end motion by two

auts that are soldered to the rod after being tightened against the U. The U. together with the bracket for A adjustment, is fastened to the post with a 1/4

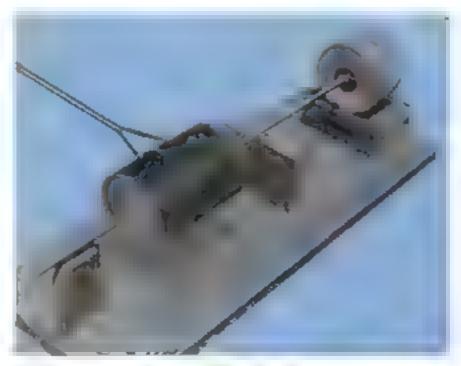
Adjustment C is made of 34-in, brass rod threaded full length, with a slot cut in the rear end for a screw driver. To the other end solder a cone cup bearing from an old clock balance wheel, as a pivot for the phonograph needle in the bab red. Supply the adjusting acrew with a nut before and behind, after inserting it in the lower hole of the upright, and tighten it with the cup bearing about 1/2 in, from the surface of the post.

Make the extension arm of 30-gauge aluminum, forming it into a tapered channel by folding up the sides as andicated. The small end terminates in a Y formed by cutting out the bottom and spreading the sides to accommodate the

stylus assembly

For attaching the arm to the weight, make a sheet-brane clamp 1/4 in, wide and 10 in long to bind around the bub, where it is held with a screw and nut in the bent-out lugs, as shown. A strip of brass 1/2 by 41/2 in., with 1/2 in, at one end bent at right angles, is soldered to the clamp and fastened to the extension arm with two small boits.

To assemble the machine, thread the suspension wire (a fine music wire, such as a guitar E-string) through the hole in adjustment rod A, and rest it between threads on adjustment B. Torn A until the pendulum, with the needle tip in the bearing of C, is horizontal from the bearing to the bob center. The weight should



The styles rests up a dram made from a can and covered with smoked paper. A threaded that't draws the drum endwise as the clock turns it

Records Distant Earthquakes

come to rest with its rod at right angles to the face of the angle iron the necessary adjustment being made by turning the rod of B

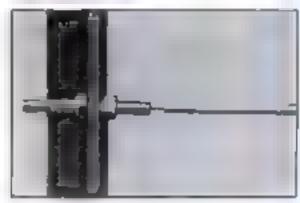
You now have a horizontal pendulum with a definite period of oscillation. The period is the time in seconds required for the weight to make a swing back and forth. With the pendulum in motion and using the farthest movement to the right as a starting point, check the time in seconds required for the weight to move to the left and back to the starting point again.

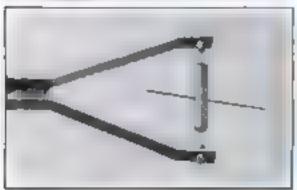
After your first adjustment, the period will probably be six or eight seconds. To change it, shift the pivot outward nearer a point directly below the upper support, by loosening the nut on the rod behind the angle from and lightening the front one. Continue moving the pivot outward until the pendulum has a period of twelve seconds

If the seismograph is placed out of doors it should be in a dry, shady spot, and a larger foundation should be used, or water seepage under the foundation will cause the needle to wander off the paper. Place a acceen around the instrument to prevent the wind from blowing directly on the pendulum, which is very

Close-up of top of poet showing method of adjusting the wire accurately in respect to length and position. These parts are marked A and H in the drawing

Below is the piver and the adjustment that in marked C in drawings A cone cup bearing from the old clock halance wheel and a phonograph usedle form the great





A detail photograph of the atylus mounting. Note that the media is counterbalanced so as to court very little pressure on the drum

sensitive to air currents around it. If the currents are very troublesome the seismograph should be entirely incosed

The recording drum is simplicity itself Obtain a tin can of about the size indicated and mount it on a 1/4-in, breastube for a shaft. One end of it is threaded, while the other is left smooth and terminated by a washer baving a square hole in it slightly more than 1/4 in, on a side

Bearings are made by drilling bar brass to receive the shaft and mounting screws. Drill one 7/16 in, in diameter and thread it to fit the shaft threads, but drill the other 15 in. for a plain bearing. Having cut off the ends, acrew the plates to wooden mounting (Continued on page 96)





How the actsmograph is set up and details of the more important parts. The dimensions are those of the original antitument constructed by Mr. Beldridge and theroughly tested over a long period

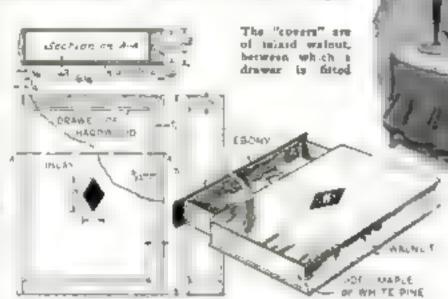
GIFT JEWEL BOX OF WOOD LOOKS LIKE BEAUTIFULLY BOUND BOOK

DESIGNED to resemble a book, the jewel box illustrated in an unusually attractive project for a Christmas gift. It requires very little stock and there is nothing difficult about the construction.

The hox or cover is made of three side-

pieces of maple or white pure with mutered joints and a top and bettom of 3/32-in, walnut. The long sideplace is grooved about 1/2 in, deep as indecared. This can be done by hand with a gauge, or the groove may be cored out with a a circular saw. The top and boltom pieces may be intaid with a small lozenge of hody or other light wood as shown, or with a more elaborate inlay, If preferred. The other part

is merely a drawer of hardwood made in the form of a box to slide into the cover. To the front of the drawer is glued a piece of abony or other dark wood shaped



like the slightly munded back of a book.

Apply a light wood filler to the walnut then give the entire box a rubbed varnish touch — PRANK NORTH DER

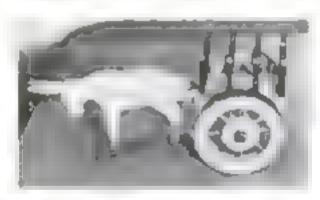
Plans for Toy Donkey and Cart That Won a National Prize

THIS toy donkey with its colorful cart has an amusing and quaintly decorative quanty that was approval wherever displayed. Rufas C. Dawes Lorsdo Taft, and the other judges of the First National Homeworkshop Guild Exhibition in Chicago last March liked it so well that they selected it from a number of much more elaborate projects for third prize in the novelty and toy division. It was made by P. F. Hirsch, secretary of the Newcastle (Calif.) Homeworkshop Club.

The wheels for the original model were cut out with a coping saw by hand from \$400, ook, not too regularly. The spokes, which are \$400, birch or maple dowels, should be spaced a trifle unevenly. The hab is bored, and the circumstrence sawed alghily irregular, A \$200, dowel is used for the axie, and holes are drilled near each end for \$1600. The side of each which hold the wheel on. The side of each

peg next to the wheel is flattened a little

The main body of the cart and the shafts are cut from a single piece of wood 1/2 by 21/4 by 61/2 m. The stakes are 1/2 by 23/2-m. dowels, those at the sides being set at an angle as shown. The cart axle is sughtly flattened and nailed to a piece of three-ply maple sufficiently wider than the axle to allow room for driving brads through it into the bottom of the cart

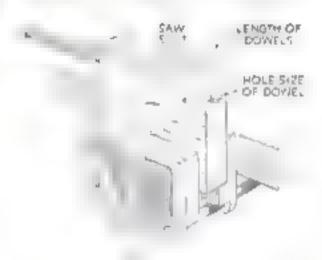


The donkey is sawed from 34-in, soft pine and fastened to a three-ply base, 34 by 134 by 336 in. The cars and tail are cut from three-ply maple and inserted in holes as shown. The tail is set at such an angle that it will not strike the bottom of the cart. A wire is passed through the holes in shaft and donkey and bent over at each side so it will not step out.

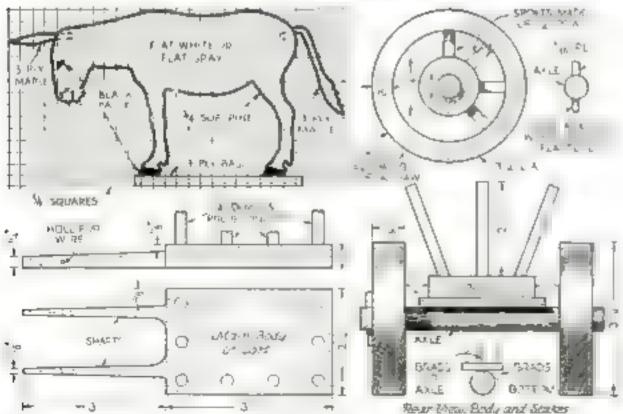
The cart body wheal fellows and kuba

The cart body, wheel felloes, and hutin are painted medium green; the axle, spokes, and stakes, bright red; and the dockey gray or flat white with black hoofs. A few brown brush marks are added on the sides of the tail at the end and also on top of the ears. A drop of black or brown paint serves for the eyes and nostrils.

JIG FOR SAWING DOWELS INTO SHORT LENGTHS



When it is accessary to cut a number of short dowel ruds to a certain length and the ends must be smooth, a jig or gauge can quickly be made as shown above. After one piece has been cut, push it out and be sure that the uncut portion of the dowel rud is flush with the edge before cutting the next piece. The jig may be held in a vise, or if a hand saw is synilable, simply lay the device on the table and saw each time in same plot.—W. B



How the cart is constructed and a pattern for the donkey, laid out on squares for easy unlargement

DONALD W. CLARK designs a solid model of a

New Flying Boat

THE ARGONAUT PIRATE

NE of the neatest planes among the smaller supplished designs is the new three place, high-wing pusher-type flying boat known as the Argunaut Pirate. The span is 35 ft. 4 is., and the length 26 ft. It is powered with a Menasco Pirate C-4 engine, which develops 125 bursepower. This is said to give the boat a service ceiling of 15,000 ft. and a climbing rate of 1,000 ft. per minute. The truising range is specified as 500 miles.

The scale of the model in relation to the real amphibian is ½ in, equals I ft. Not counting the wire struts, there are only seventeen parts to this model. If the struts

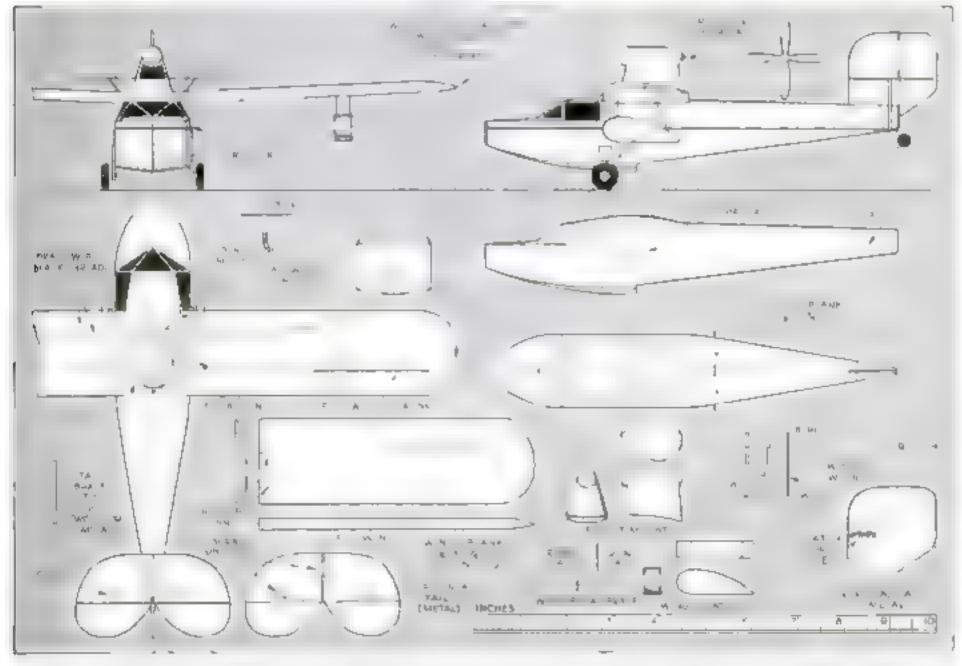
are included, it brings the number of pieces up to twenty-nine.

Like all the planes given in this series, the Argonaut Pirate is so simplified in constructional design that readers will have little trouble in making and assembling it, provided, of course that they follow the drawings closely and refer to the photographs. The number of parts required is reduced to the lowest possible figure and the true design of this flying boat could not be duplicated in a model with any less than the twenty-nine parts indicated.

The suggested color scheme is silver, red, and black. Paint the entire model aluminum, put a red stripe along the sides of the hull, as shown, and make the windows, tail wheel and hinge lines black. Dioping the wheels in ink will give the tires a realistic appearance.



The parts of the model ready for easembling. There are twenty-sine stores estagether but a dozen of these are simple strute and braces



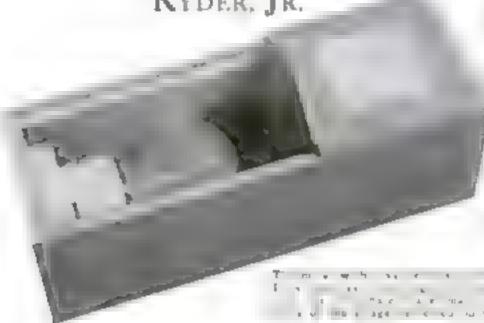
Frunt, side, and top views: details of the ball, engine mount, tail members, wing foots, and other parts; and a scale for finding dimensions

HOMEMADE

Light Meter

Takes Guesswork out of Enlarging and Printing

By Frederick D. Ryder, Jr.



aw lamp and stide
oring up the stide
the lightest poror enlarging earn! diffe

THE amateur photographer who does his own developing, printing and enlarging could only hit exactly the right exposure every time be takes a picture, the job of printing and enlarging would at once become far simpler and less wasteful.

Unfortunately, however, even the expert cannot make uniformly perfect negatives under varying conditions of light and the average amateur, especially the beginner, spoils sheet after sheet of paper trying to find the right printing time for negatives of every conceivable density

In enlarging it is, of course, quite practical to save a lot of the paper ordinarily wasted by culting large sheets into narrow straps that can be used for testing. Another useful scheme is to sort your negatives into piles according to density before you start work. Then by carefully comparing the negative you have just printed or enlarged with the one you will do next, you can get some idea of what the correct exposure should be. Such a test can best be made by holding the two negatives side by side in front of a beightly lighted piece of white paper

The chief difficulty with such a test is that it can only be approximate at best because when the negatives are not of exactly the same density, it becomes a matter of guesswork as to just how much difference in printing time will equal the apparent difference in the light-transmitting power of the two negatives.

What is needed in a way to measure with some degree of accuracy the actual density of each negative. The simple, easily made light meter filustrated on this page supplies that need. You will be amazed at the accuracy with which it will give you the correct exposure for any scale of enlargement from any negative, no matter how thin or dense it may be

The principle on which this meter operates is very old. In fact, the earliest accurate determination of the randle power of various sources of light as compared with a standard candle was made by a piece of apparatus working on almost exactly the same principle

The basic idea is to adjust a variable source of light to match the unknown source and then read off the strength of the unknown source by the calibration of the variable known source.

The accuracy of the avs em depends on the fact that the human eve will determine very closely when two surfaces are flummated to the same intensity (if they are of the same color), although the eye is not at all accurate in estimating the difference in brightness when one surface is more brightly lighted than the other.

To use the homemade exposure meter, all you do is place it beside the enlarging easel and draw up the slide till the lighted panel in the meter is of the same brightness as the lightest portions of the image thrown on the enlarging easel by the lens. Then you read off the correct exposure from the figures on the side of the slide. You will find that the resulting enlargement is correctly timed within surprisingly close limits.

It is obvious that the general principle of a uniformly lighted surface with varying light control (Continued on page 78)



How the motor is constructed. Note the curved reflector visible through the square opening

Make a picture like this fought!

HALF of life is lived indoors . . . And what no important half it is. Now the new ultra-fast Kodak "SS" Film helps you make the most of it. You can make anapshots indoors, at night.

Very timple, too. In addition to the new Kodak Super Sensitive Film, all you need is a camera with an f.6.3 (or faster) lens, and two or three Mazda Photoflood bulbs. (See diagram below.) Hold camera in your hands-as you would outdoors. Read the simple instructions. Follow them and find a new picture-taking thrill-tonight.

To ewners of Brownies and inexpensive folding comeres ... Here are two ways you can take this picture tonight. One-use a Photofieré bulb. Load with Kodak "SS," particularly adapted to night picture taking, or Verichrome Film, which will also give very good results. Set camera on a table . . . open for "time" exposure, flash bulb, close shutter. Another—set camera on a table. Watch your chance when buby lan's moving; make a quick "time" exposure. Use Marda Photoffeed bulbs. Load with Kodak "SS" or Verichrome Film. See your dealer for informating . . . or write for folder.



Use one Mazda Photofood built in facup A . . . two in hump B, distances as Indicated. Tip shades to concentrate light. Load camera with Lodek. 85" Plim. Stand 5 feet of more from subject, depending on camera. Less at JA.3. Exposure 1/25 second. Click camers—you ve made the picture.



KOBAK "35"-the super neutrice film particularly adapted to witht picture taking. Comes in the familiar yellow hoz

MAZDA PROTOFLOOD BULBS - give brilliant light but for musty pictures cost but 25c. Any camera with an J.6.3 lens or faster will make night enspehots.

MODAL JUNIOR MX 38—with f.s.3 Acceptional from it ideal. Pictures 2" a" 8 3" a" -- price \$13 50. hodak Junior Sas 16, with / 6.3 ferm, picturne 216" a 41."-\$15.56.

Ask year disdor shoot the current \$2500 Prist Contest for Hight Pictures. All asystem picture takers digities.



FREE FOLDER

Gives complete instructions on night photography . . . suggests subjects ... tolic you how to make pictures at night with Brownies and inexpoosive felding comeres . . . fastmas Kodak Company, Rechester, M. Y.

2 6 16-23

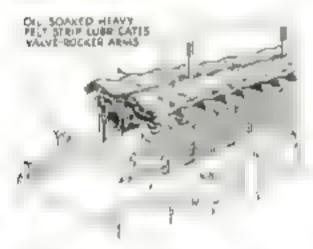
Timely Aids for Autoists

Readers Tell of Inexpensive Ways
They Remedied or Prevented Troubles
Commonly Encountered by Motorists

As a substitute for a tire pump, I carry in my car eighteen feet of tubing, fitted with a petcock near one end and snap-on valve-stem connectors at each end. When a tire develops a new leak, I simply use the bose to transfer air from my spare and the other tires to the soft one. The borrowed air builds up enough pressure to get me to a garage—E. E. McG

Oiler for Rocker Arms

THE rocker arms for end cylinders of valve-in-head motors sometimes run dry due to all leaking out at the other tockers along the way. To remedy this, install a felt strip over the rockers. The excess oil at the center rockers will be soaked up by the felt and carried to the end units.—E. J. N

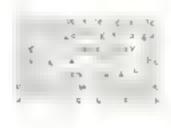


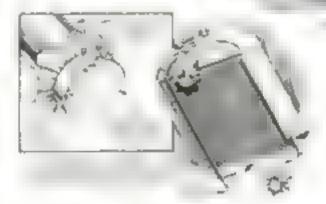
Packing Old Water Pump

IF YOU are having trouble packing a worn water pump, here is a stunt that is worth trying: Instead of the usual packing take a length of solid wire solder wind it around the shalt, and squeeze it home with the packing out. The solder wil, wear in and file completely all the uneven surfaces in the shalt—G. M. W.



Wire solder is wound around shaft for packing





Testing Leaky Radiator

WHEN using the water test to locate radiator leaks, the problem of plugging the inlet and outlet pipes presents it self. An efficient method consists of cutting two five-toch squares from an old inner tube and fastening them in place over the openings with hose clamps. A rubber square can be used to seal the filler opening if the cap gasket is worn. Finally, a wooden plug forced into the overflow pipe completes the water-tight job. Once scaled, any water that appears comes from a leak in the core.—J. P

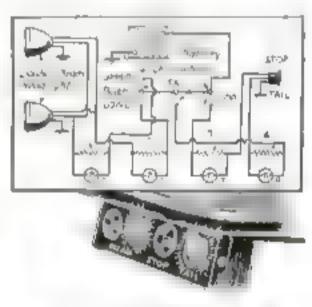


Reversing Gasket Makes It Fit Like New One

AFTER channing a gasoline filter bowl, it is sometimes difficult to reassemble it and prevent leakage. This can be avoided however simply by reversing the cork gasket. Continuous pressure of the bowl against the cork forms an irregular surface or ridge. By turning the gasket over, the flat side of the cork is placed in contact with the bowl edges, allowing a new seat to be formed.—W. G. L.



IVITH the pilot bight panel, shown below installed on your dischboard, you can tell at a glance just how your head-lights, tail light and stop light are functioning. This easy-to-install arrangement consens simply of four small bulbs which are mounted behind red-jewel windows and are connected into the lighting circuit of the car as indicated. The values of the resistances used (1, 2, 3, and 4) will of course, depend on the type of bulb used. They should be just large enough to allow the pilot light to glow without causing any appreciable dimming of the car lights.—L. P



Jewe'ed dashboard lights tell how car I ghis are working. The diagram gives wiring circuit

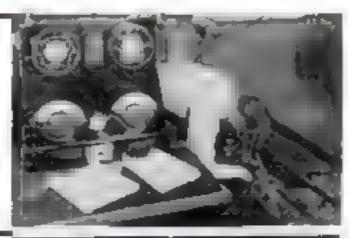
Fixing a Gracked Battery

WHEN a crack develops in a storage-battery case, an emergency repair often can be made with the materials found in a tire-repair kit. First prop up the battery so that the liquid does not leak out. Then, after washing and drying the case clean the crack and roughen the surface. Finally, smear patching cement in and around the crack and, when it has become tacky, press a strip of inner-tube patching material into place. A board and string can be used to clamp the patch in place until the cement has had sufficient time to dry.—N.]

FORD BATTERS

HAVE TO BE GOOD

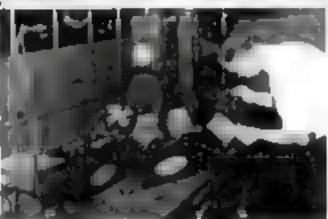
Detary aspection for a security measured by these security maters. Specific gravity and temperature readings are total for each for each



For sold tests the betteriot are placed in special partingers turn where below more turns erests specially are are supported in winter driving.



After tetting, betteries are tern down for service internal inspectant to determine the need itten of plates, separators, electrolyte, self covers and sentalmer,



Testing laboratories throughout the Ford plant safeguard Ford quality. Battery testing is a typical example.

The battery laboratory is continually testing production batteries to see that they always measure up to specifications. A battery has to be good to retain 85 per cent of its original efficiency after 45 discharges and 45 recharges with 100 per cent overcharge each time. Ford batteries meet this test.

The ability of the Ford battery to crank an engine is constantly checked. This test is as severe on a battery as holding a starter button down for more than eight minutes --something no driver would ever do.

In the constant overcharge test, fully charged batteries receive a 10-ampere charge continuously, day and night for thirty days. This approximates a 2000-mile non-stop run at 25 miles per hour without once using the horn, lights or starter.

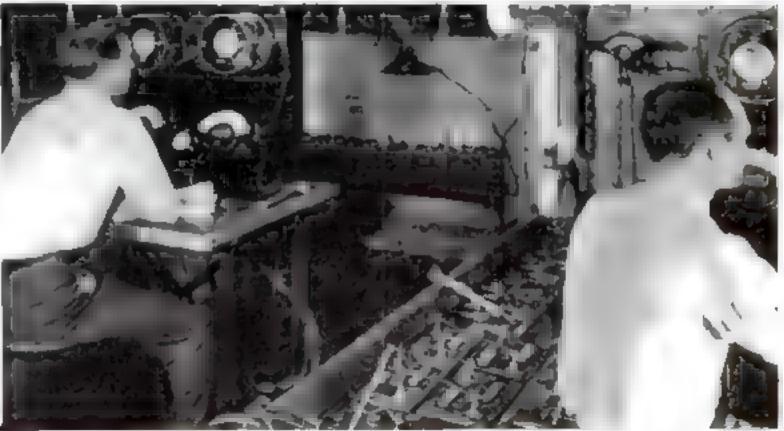
The reason Ford butteries can meet these and other severe tests is that there is no skimping on plate area, plate thickness or quality of materials. When your battery needs replacing it will pay you to get a Genuine Ford Battery.



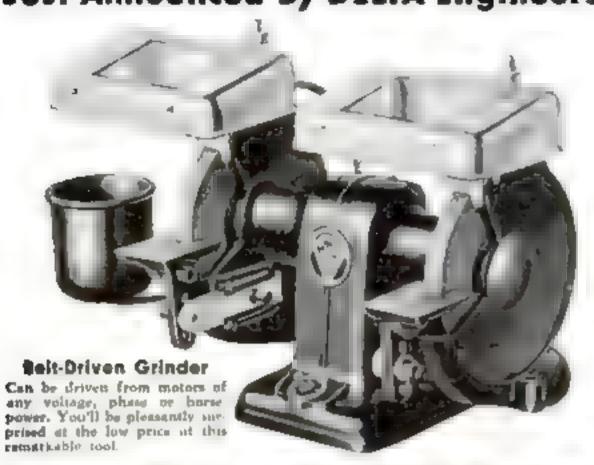
FORD MOTOR COMPANY

DEARBORN, MICHIGAN

The Fard Battary Laboratory is equipped with every scientific device for detertwining statisty. Enterioundergaing normal discharge test are in tunk which automatiantly emplotation battery alectralyte at possions.



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This "Triple-Duty" machine embodies numerous features that make it the most efficient grinder ever developed. These features include 1. Balanced Wheels to insure true run aing and absence of vibration, 2. Maximum room on all models to permit operator to swing work around wheels 3. New Departure self-scaled ball-bearings. No oiling needed for life of bearings; 4. Very efficient wheel guards, complying with all safety codes 5. Convenient built-in switches on all models:

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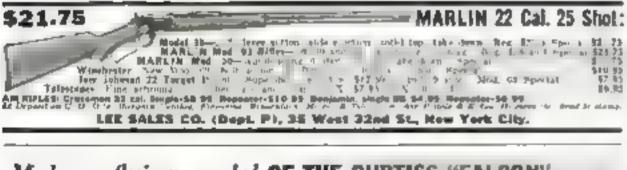
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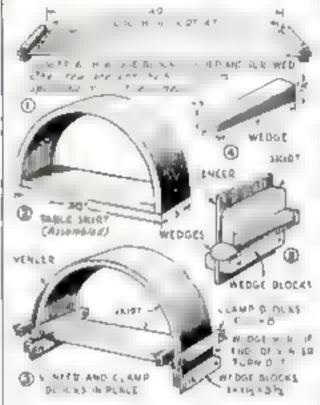
DUCO Household CEMENT

HOW TO VENEER SKIRTS OF HALF-ROUND TABLES

M ANY amateur woodworkers would make attractive half-round end tables and similar paces if they knew how easy it is to years the circular skirts

When the skirt is ready to be veneered, cut the veneer ½ in, wider and 6 in, longer than necessary. Let us assume the dimensions are as in Fig. 1 and 2. Next prepare four blocks 1 by 1 ½ by 5½ in, and fasten them to the veneer in pairs with glue and two 1½-in, wood screws as shown in Fig. 1 Make two clamps as in Fig. 3, and bore them in pairs for 4 by ½-in, bolts, 6½ in, apart. Also make four wedges, Fig. 4

Use cold water or prepared liquid glue, as hot glue chills before the Joest can be made Apply glue to 3 in. at one end of veneer and skirt and place veneer no skirt. Fasten one set of clamps as in Fig. 3 with only enough pressure to keep them in poution. Apply glus on



The veneer is clamped tightly against the surved surface by driving wedges where shown

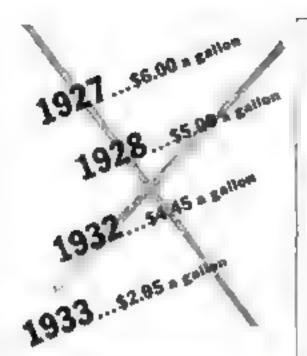
the remainder of veneer and skirt. Bend veneer around skirt and fasten the other set of clamps. Between the each of the circular skirt and the blocks on the veneer, insert wedges as in Fig. 5. Prom veneer with hands, working from center to ends, as in massacing if the ends of veneer turn outward, place a pair of wedges as indicated in Fig. 4. Drive these wedges only hard enough to keep the work in position

When the plue is thoroughly dry, remove wedges and clamps, and trim veneer to also of skirt. Always veneer round table skirts before attaching the less. To veneer a skirt in this way with the grain of the veneer vertical, or across the skirt, first plue the face veneer across the long piece, as in cross-band veneer,

and proceed as before

If it is desired to use a crotch, burl, or other fancy veneer in which there may be bulges, substitute for the veneer in Fig. 1 a piece of tin or galvanized sheet from not heavier than 26 gauge. Attach the wedge blocks with three screws, but otherwise the same as Fig. 1. Join up with paper tape all the pieces of veneer until about 1 in. larger than stort. Apply glue to surface of skirt and place veneer on skirt. Drive two or three 1/2-in. No. 20 brads at center to hold veneer. Apply band clamps as previously described and insert wedges as beform. Drive hard enough to bring all parts of vencer in contact with core. Light tapping over bulges in the veneer with a rubber maliet or a fest sand block under the hammer is belpful in obstinate cases,-R. C STANLEY





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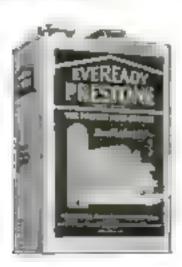
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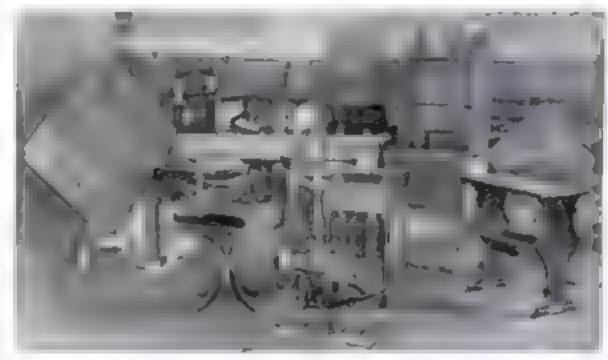
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Craftwork displayed at the annual exhibiting of the M diletown (Conn.) Homeworkshop Club

How to Start a HOME

WORKSHOP CLUB

VERY ONE interested in the hobby of making things should belong to a home workshop club. The friendly and stimulating companionship will enable you to do more and better work and get a lot more fun out of it

This has become well recognised since Perthat Source Mostaliy began to urge readers to form clubs about two years ago because 141 local clubs have already been organ sed and granted charters by the National

Homeworkshop Guild

A list of the cities and towns in which clubs are established to given in another column. In the smaller places it is usually easy to find out where a club meets by asking any of the local hardware dealers, but if you are unable to get this information, just send a self-aridressed, stamped envelope to the Home Workshop Department and salt for the address of the secretary of the club nearest to your home.

As yet there are not that there is no club in your own locality, even if there is one somewhere else in the same city. A home workshop dub really should be a neighborhood affair, where the members live within a few blocks of at most n mile or two of one another The thing to do, then, is to start a club of your own. The steps are simple, the expense trifting, and the work nominal, yet the satisfaction you will get is certain to be beyond all expectations. Here is what you should do

First get a few friends to belp you in organiz-

ing the club. Make a list of those you think might like to juin, Visit local hardware, himber, and point dealers and ask them to give you the names of some of their customers who are amateur cruitsmen. Visit the local school and talk to the manual training teacher, if there is one

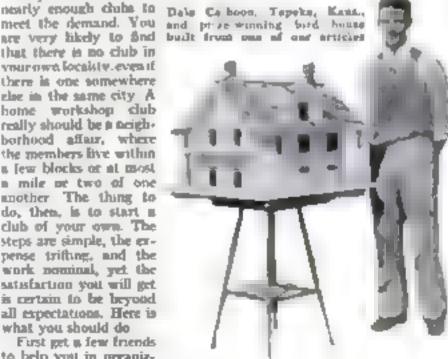
When you are assured of five or more members, call an organization meeting. This can be beld in he limme of and of the men unless you expect a fairly large crowd, its which case you can easily arrange for a meeting room in a school, a church hall, a club, a hurdware store, or possibly in some industrial plant. Send notices of the esceling to the local papers.

When the meeting is held, have a temporary chairman elected and open nominations for officers. These may be temporary officers, if you wish to defer a final decision to the following meeting. As soon as the officers are chosen, let a committee be appointed-three members should be sufficient—to draw up the constitution and by-laws and report at the nest meeting. Decide upon a good name. The majority of clubs have names like the following. Bristol Homeworkshop Club; Iroquois Homeworkshop Club of West Springfield,

Mass., Leatherstocking Homeworkshop Club of Cooperstown, N Y

If the members wish to become affinated with the National Romeworluhop Guild, un application for a charter will have to be filled out on a special form required by that organization from all applicants, It is necessary to list names and addresses of officers and members, give the proposed name of the club, and remit the first year's dues, which are fifty cents a member

Suggestions for a charter may be found in various handbooks and manuals on parliamentary law. Article I should give the name of the



Where Home Workshop Clubs Are Located

Albande Nebr Amor Bo Tena Antar Do Texas An each Calif Ash hula libby Asian a fea Auburn Carl Auburn Carl Auc n Tean Berkers W Va Bill nes Mont Homotogi in Ind Homotogi in Ind Homotogi in Va. Borten Ind. Bridgepage Conn Brosel Cont. Brook Team Brenchmen, Mac Brunswich, Me Roffin, N. y Characte, N. C. Brunow N. 3 Buffalo N. 3 Childre N. C Che in Pa Chavrenne Wyo, Chavrenne Wyo, (bu give | Che nagta, Ohio Cleveland, Chio Culy Wyn, Chenan Alberta, Lua. Contraction of A resident Ky Inday V Prin. hell soft Loved. hell et or of Lanes, Minn. a reports bunkark N 5 North in Mann. bar, balire Fra hazate b N J hatterst I hatters N V Printing. Compression from hugene Ore an title Ind. antich Ana antich W Va au field Facilities W Va Facilities W Vi Fact Math Fact Math Fact Divige Java Fact Wayne Ind. Frequet N. V. le Fig Cort II Cane-marg. Glen Le in Pu George Facts Mont Britismonth, Jud. Humpton, Va. Inhohen N I olton, Karm, week! Y Інятаря Ра. lanks to filte. Pla latter the W. Karamaron Amil Konaul, Kans Konaul, Kans Konaulite Texas In terange 118 Lausdaire Pu Lausdaire Pu Lausdaire Ind Lausdaire Mays. Le Roy N A Leaning Ing. Ky Leaning Veire Little Rock Ach Lorde Re Kr Lorde Mass Mande h N I Martin R S Dan. Marting Wist H. hansbester handtowen Wise

Marshalltown, Iorn. Mayatoul, N. J. M. Kresport, Pa. Memphe, Tenn. Meanmonte Who-Vision Fia Vision ity Moot Mississipping Cine Monte Aug Can.
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club, and Article II its object, which may be expressed as the promotion of active interest in home workshop bandicraft by the interchange of ideas. It is well to state that none of the club activities are to be carried on for profit to the club. Article III can state what officers there are to be, usually a president, necretary, and secretary-treasurer in small clubs. Article IV can provide for a board of governors, the usual membership being the officers of the club and three other active club members. Other articles can cover the qualifications of members, elections, dues, meetings, order of business, vacancies, what constitutes a quorum, and how amendments to the constitution may be made

Another important (Continued on page 79,

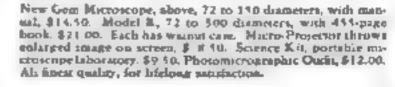




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Science Kit

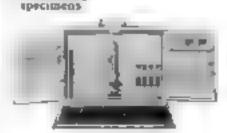
HIDDEN from the unasded eye Nature has conceived more grotesque monsters and glorious besuttes than the human mind has ever conceived. To wander among these is a breath-taking adventure into the marvelous that grows more exciting with each new revelation. Magnification up to 150 or 250 diameters is ample for most actentists. Of far higher importance is abort detail. So Bausch & Lomb amateur microscopy equipment, most comprehensive line offered anywhere, is made by the same craftsmen who produce condiest models for world-famous doctors, laboratories, research acientists. No wonder you get amazing details clearly.



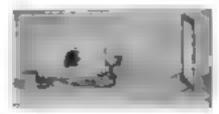


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The Heat-Director gives clean best that can be increased or decreased instantly by a turn of the dail. The fuel used is No. I feel oil, distillate or herosens. The removable fuel tauk holds enough for an many as forty-two hours. This feature is particularly valuable in cases where a stove-heated hundling must be kept warm over a huliday or a funday. There's nothing complicated about installing a Heat-Director. Just set it up and connect with a flue, like a stove. Draft regulation is automatic. Superfex Heat-Directors are made in three sizes, finished in porcelain enamel in rich buried watnut design. There are also several radiating models.

Per one-room chilly spets, see the emert modern decions in purtuitly Perfection Room Heaters

SUPERFEX



LIGHT METER AIDS IN ENLARGING

Con much from page , af

could be worked out in a number of different ways. At first giance the simplest method would appear to be to use a rhenstat. However, rheostats suitable for controlling a single electric light bulb from dark to full heightness are difficult to obtain, expensive, and bulky. Another method would be to mount the electric bulb in such a way that it could be moved farther away from, or closer to, the surface to be agained a speciments were made with this method also it works well, but the unguinty length of the resulting exposure meter and the mechanical construction of the alide mechanism are vital objections.

BY PLACING the light bulb to one side as shown, with a curved white reflector under the surface to be illuminated and a side to control the amount of light that reaches the reflector, a aniformly lighted panel and complete, smooth control of the light are obtained in the simplest passible way

The first job is to make the hox. The inside dimensions are roughly 2½ by 2½ by 8½ in. If you are handy with woodworking tools or you like to work with sheet metal, use wood or metal. If not, a astofactory box can be made of heavy cardboard. If you use the latter material, provide a cord on ich so that the light can be turned off except when you are making a light measurement.

In any case the most important requirements are that the host be reasonably inputtight and that the size and shape of the box and reflector be approximately as shown.

In the location shown, cut a window in the top of the box exactly 2 in. square and fit some sort of beading that will support 2-in. squares of ground glass or opal glass. If you make the box of wood, you will find that four ordinary wooden safety matches, when glass in place, will do nicely to form the ledge on which the glass squares may rest

The reflector can be made of still whate drawing paper held in place with small tacks along the lower edge. If made of metal, it should be pointed with at least three coats of flat white point. The fitting of a porcelain socket for the electric light bulb presents no special problem

If you have no facilities for grooving the sides for the slide, equally good results will be obtained by cementing wooden matches in place to act as guides. The slide can, of course, he made of any available sheet metal or stiff cardboard.

The first step in calibrating the exposure meter, after acrewing an architect 15-watt bulb into the socket, is to get the lighted papel on the exposure meter as bright or a trifle heighter than the Eighted surface produced on a piece of white paper on the easel when no negative is in the enlarger and the lens in set to its largest opening if it happens to be adjustable. This adjustment should be made with the slide all the way up, of course, but before you make it you must decide in which of two ways you prefer to use the meter

ONE way is to make each test with white bight before the enlarging paper is put in place, a duranty piece of white paper being used izstead, and the other is to fit a red screen over the enlarging lens and another of exactly the same color over the illuminated panel of the meter. The second method is much the better, first because it is more accurate owing to the difficulty of setting enactly the same shade of white light from both the enlarger and the meter, and second because it saves time

The simplest way to obtain precisely matching colors, is to use the same filter over the highted meter surface that you do over the enlarging lens. A suitable filter it the rot A after in the Wratten series of mexpensive gelaus filters. This filter comes in . In squares. Drop one into the panel in the excessive meter and cut the other into a circle to be fitted to a cardboard lens cap

When both filters are in place, the brightness of the meter light with the slide all the way up is adjusted to match the light on a piece of paper on the easel by adding squares of thin typewriter paper to the meter opening till you strike the right combination. These together with the gelatin filter, can be placed between two squares of ground glass or opal

The next step is to cambrate the slide, If you happen to have on hand a number of negatives of different density the correct emerging times of which are known, it is merely a matter of placing the negatives in the enlarger matching the hightest portions by pulling out the meter slide, and marking lines across the latter with exposures in seconds or minutes as the case may be,

If you haven't any such negatives, then you will have to proceed by trial and error, marking the slide each time you hit the right exposure for a negative of different density

ONCE you have the meter completely callbrated, you will find that you will carely speal a sheet of paper through incorrect exposure, provided your method of development gives a reasonably uniform degree of contrast in your negatives. Remember that when the exposure of the negative in taking the picture is within the latitude limits of the film variations in exposure only change the density of the negative. The degree of contrast is controlled almost entirely by the lighting of the subject when the picture is taken and by the length of development.

So if you are careless in developing your negatives and you get one batch than and flat and the next so harsh and contrasty that they give noot-and-whitewash effects when printed even on soft paper, you will have to make some allowances in enlarging time. For thin, flat negatives give a little less time than indicated by the exposure meter. For harsh, contrasty negatives, add twenty-five to fifty percent to the meter time. Experience will soon guide you in this respect

When you use this meter you can forget about any differences in exposure time caused by changing the scale of the en argement or by changing less. Since the meter measures the article intensity of the light on the surface of the paper, it will give you the correct exposure he matter what the scale of enlargement or the opening of the less disphragin

It will be apporent that exactly the same method of using the meter will work out with any of the ordinary printing machines where the light is underneath the pegative and the paper is placed on it, face down. If you print with an ordinary printing frame held up to a light, then it will be necessary to make a dammy illuminator for your pegatives and also to standardure on one use of electric light bulb and a fixed distance between the printing frame and the light. The Illuminator can take the form of a simple box like the meter with a panel of the same size, but without any sliding light control. Use a filter to get the necessary color match for the reason previously explained

To determine the printing speed of a negative, the most important portion of it will be beld against the illuminator panel, and the meter panel adjusted to match. Of course, the meter will have to be calibrated by test, and the marks can be made on the other side of the slide so that one side will be callorated for enlarging and the other for printing,

HOW TO START A HOME WORKSHOP CLUB

(Continued from page 77)

matter to attend to is the appointment of a capable member to look after publicity. Nothing is more important to the successful growth of a club than adequate and informative reports in the newspapers. Prepare an account of the meeting with the names of the officers elected and send it immediately to the local papers. In a small town, include the names of all present. Mention when and where the next meeting is to be held. A brief announcement should also be given to the papers just before the second meeting. Make it clear that all men interested in the home workshop bubby will be welcome

At the second meeting, elect permanent officers if that was not done at the first, and adopt the constitution and by-laws after discussing each section and modifying it, if necessary, until it meets with general approval Let each man present give his ideas on club activities, programs, and projects. Find out what particular branches of craftsmanship each member is most interested in. In general, lay a foundation for future meetings. It is a good plan to have one of the officers or a member make a report on what other clubs are doing

ADVISORY COUNCIL

NATIONAL HOMEWORKSHOP GUILD

Professor Colling P. Blug Dean of the College of Engineering, Acre Park University

Professor Clyde A. Bowman Dean of the School of Industrial Education, Stout Institute, Mengmanie, Wice

> Harvey Wiley Corbett Architect, New York City

Dr. Hugh S. Cumming Surgeon-General Linned States Public Realth Service

Maj.-Gen. Benj. D Foulois Chief of the Air Corps, U. S. Army Capt, E. Armitage McCann

Founder, Ship Model Moker's Cinb Dr. Francia G. Pease

Astronomer Mt Wilson Ob recotory Frank A. Vanderhp

Banker and Publicut, New York

This can be done very easily by constituting back issues of Portlan Science Monthly and making notes of the various activities described at the club news columns.

With very few exceptions, the clubs meet every two weeks. Some clubs have a business meeting only once every lour weeks, the alternate meetings being given over to demonstrations, visits to workshops, and other activities. A few clubs have additional informal meetings at the shops of various members for the purpose of working on projects. In such cases a project committee is appointed to supervise the work and arrange for materials.

POPULAR SCIENCE MONTHLY is the official magazine of the entire boose workshop club movement. Be sure therefore to send a prompt report of the organization, followed later by reports of all activities, to this magazine Inchide any poteworthy coppings from local papers about the club and any photographs you have taken of unusual projects, home shops, special club demonstrations, or other undertakings of general interest. We shall be glad to announce the formation of all new clubs as soon as we receive the details.



A CONTEST A MONTH DURING OCTOBER, NOVEMBER, DECEMBER .. 89 CASH PRIZES EACH MONTH

2 prison of \$100 each 10 prism of \$10 each 3 prizes of \$50 each 20 prints of \$5 each 4 prisos of \$25 such 39 prices of \$2 week

COST Record Trials

Get out your camera and go after one of these neah prizes tonight. Any emercut pinture taker to eligible and winning pretures will be chases for brand human interest appeal . heart throbs or humor ... ruther than for photographic skill. Of pourse the more pictures you enter, the greater your chances of winning.

You'll had source of likely subjects around your home . Baby's smile . . the children at play . . . Hallowe'ss . parties . . . pictures that tell a story.

EDM TO TAKE THEM



You can eateh these seemes with your neceere as costly so you take sompohots in sunlight .. thanks to G-B MAZDA Photo lumps.

Simply server two or three G-E MAZOA Photobood lamps in bridge, floor or table lamps, load your camera with supersensitive film and shoot away. . . teking SNAP-SHOTS, if your camera has a fast \$/6.3

lent, or QUICK TIME EXPOSURES, 4 you use a hox or slow less to ding asmers. These lamps are 400d for dozens of pictures, buggleds of feet of home movies and opet only 25 cents list.

For shots of behies, pets and action, use G E MAZDA Photofiesh lamps (15 cents list) Each lamp gate only use picture but you get it in 1/50 of a second . . . fast enough to record sormal action. And you den use these lamps on fleshight betteres or house current.

Get some lamps and film from your drugfirst or camera dealer, and begin taking pictures tonight. You will have pleaty of fue, you have a good chance for a prise; and you will get precious pictures.

Ask year dealer for a folder "Snapshats at Night Contest" on this \$2500 contest ar write Dept, "A", General Electric Company, Nela Park, Cleveland, Ohio.

- Early pring principal princips with waggains and sole the by for ad an issue publication and out Silker by any repeat and havened the property of the Greenel Stratific Completes
- East print must have the o'ther a them find, address up the tack. By prime will be crimened.
- differentials for the Ortober treatest heart is much ed and inter their editought. Newworks 1 Newtonist conjust, and later their military. provided contest, and there then milestyll (became the for the of far the dispersion people), but faire that soldings for the dispersion people, but faire that soldings for the dispersion for the proof of the people of the sold of the people of the sold of the people of the sold of

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JEWELRY MADE FROM CELLULOSE TAPE

*OLORED cellulose to a C in the widths used ages, can be used for max durable yet acht moes The nution is made in t color combinations, so I match any costume can be se-Cut a wooden disk of the pr ameter for forming the bracelet, and use a dowel or other round stick as a core for winding the ring. As the ribbon. is wrapped an and the freely with transparent hold cement thinned as accione, or a rement made by desolving forting of transportent cettuloid in acetone. A colorful mag From fifteen to twend V C by thre curns are necmetch formed by essary according to comentant together the thickness desired at to the fa Lay the completed nnes and bracelets H wither ag was aside to dry on ic y w Cellulose Scotch tape, which is adhesave on one sade, also may be used for many decorative purposes.-- K. M.

START MAKING GIFTS FROM OUR PLANS

25

25

25

25

25

NOW is the time to begin planning those Christmas presents you intend to construct yourself Our list of bluepents will provide any number of good suggestions.

The following titles are only a few of the famous Port are Seather Montains blue-prints If you do not find what you want here send a self-addressed stamped envelope at once for our complete list

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High-Speed Soes for Small Outboard Mo-	
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or aboard motor) 175-176-177 R	1.00
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used with outboard motor 224-#	.50
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Nors: Suit-size parterns for any boat marked with acterick. (*) will be drawn to order for \$1.50 e.	h Ko Stra

SHIP AND COACH MODELS

Constitution has are available for a Afreraft Careier-U & B. Saratoge (18-in.) and flush deck destroyer (8's in.), Bartlesh p. t. & S. Tores (3-(t. hull.), 197 198 199 200 Bortle, Ci pper Bhip in, 127 127 Clipper fin p (20 g n. huil) 5, 52-53-R ... Constitution 2 in hult, 37 38-59-R...... Crusser Brooklyn (4-in) 336... Crusese Tuscalocas 1114 (m.), 254 Freighter Ocean + 6 In 1, 27 L. Gallach Revenge (21-in). 104 207-208-208 Hartford, Farragut's Flegshap (\$11% is. holl), special prints 221-222-R..... H. M. S. Bounty (656-lit. finit), 254 1 00 33 15 Liner-California (2 jin). 25f .ap .23 Lines-St. Louis (11-In.), \$15an Sedan Chair, 121 120 Show Bost, Doumonated (14 in) 263 Bingecoach with barnes, 144-145 146 R Strambert, Microscoppt, 1954 In.) De 95 96 R 1 00 Atlantic (h in.), 335 ... Trading Schooner (47 - 4n. hul' > 352-285 50 "Treasure Island" Hispapiola 7:40.) 23725 V hong Ship 170% on 61-62-30 Whater- Wonderer 201 p. to. 151 to 154. Yacht Rainbow (75; in huil) 232. . . Yacht Sea Scoot 42-in racing), 206-107-R 75 Yacht ,20-in, racing), 47-R many or our

Popular Science 353 Fourth Aven Send we the bluepe as follows	ua, New 1		bered
I was lawforeng	dollars		FREEZA
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Strict			-
City and State Twase to no your nam	ne and addre	en clearly	

LOVE SEAT IN EARLY AMERICAN STYLE

(Continued from Jage 631

List of M	laterial	5	
Co. of Neces Description	т	W	C.
Hack post	15 16	6 6	26 18 45
2 " ends 2 Front less 2 Back "	15 6	7.4	36 24 15
Hack slat	1 1/16 13 16 13/16	6	40 40 56

13 16 10

30

of front legs on the line determined to operation 7, and hore 7, an hose in top

butterfly flaps

Note All directions are to inches

Arms

6 Cut out back posts, shape and fit each to sent with draw-up wedge. Leave that dovetail morphes till later

7. With back posts in place, fit horizontal back slats, cut dovetail shape on slat ends, then scribe their outline on back posts. While back posts are still in place, put in front legs, marked with proper cut-off point at upper end, and level across to rear posts with straightedge to locate mortise for rear end of arms. This should be even with upper edge of the middle slat. Then remove posts and cut slat and arm mortises Glue posts and slats together first making sure that the posts will still enter their sockets accurately when assembled with als s.

8 G. ac legs in place Rear legs are assembled

with wedges driven from the top into wedgeshaped slots sawed in the leg tenons. Use a sharp chisel and scraper to trian off the projecting tenons Bush with the top of the seat.

9. Glue the back in place 10. Make up and fit arms to back and

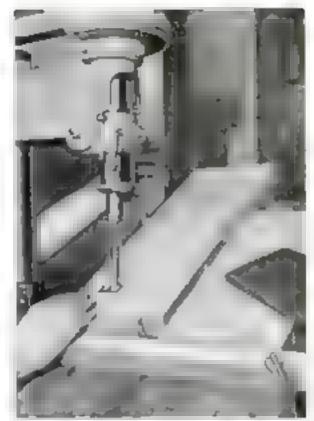
front legs with screws and dowed as detailed. Remove arm and fit rule joint and langes to drop leaf

12 Make up betterfly flap. With arm in place, square down from pivot peg gloed in underside of arm to locate prvot down in seat. Leave this down long so that it can be removed from below See that the dap is properly held up with the wedge stop in place. Take off the flap and drop leaf for finishing and goe the arm in place.

12 Fit the seat state and remove for finishing. Instead of the wooden slate shown, the usual interlacing flat steel bands with spiral springs at the ends may be installed. These

will give a softer seat.

t3. The finish should match other pieces if the settee is to be added to an existing group. The following method products a lustrous reddish brown shade that brings out the boauty of the gram. First, monten the piece all over with a wet mg to rame the grain, and sand off the fuzz when dry, Apply Early American water stain and sand lightly when dry, Two coats may be necessary to get the desired tone and to cover up any places exposed by sanding, Rub down hard with Heel wool. To darken and produce a deep luster, you may apply a coat of transparent filler darkened with a small amount of watnut stain and thinged with liraced oil and turpentine. Seal with a thin coat of shellac and rub with steel wool. Repeat the sheliat coat three or four



Boring holes in sent on trued drill-press

times, and finally the a good furniture wax. The cushings may be obtained from a furniture store. The sizes given, 11 in, square for the spring text cushions and 10 in, square for the back cushions, are common dimensions. If the cushions are not obtainable in these sizes, you may either have them made up by an upholsterer or after the setter dimensions to suit sizes readily available.

This settee was built at a cost of 87 50 for the maple, \$14 00 for the cushions, and about 30 cents for the hinges and finishing materials.



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ingram's can promise and deliver better shaves because its three special ingredients help shavers these three ways—

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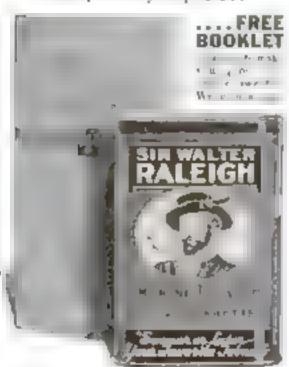
INGRAM'S SHAVING CREAM

FATAL FUMES

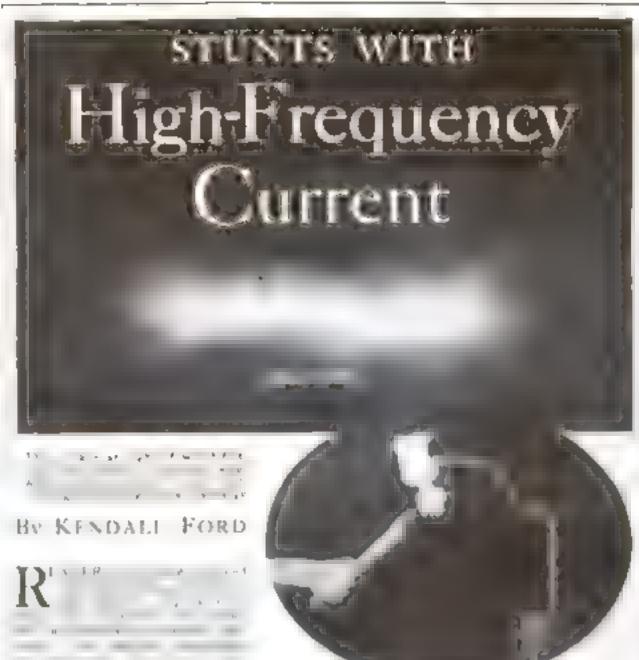


MADAME, if your husband's burning rubber, won't you please remind him to get a pack of pipe deaners and a tin of Sir Walter Raleigh Smoking Tobacco? Yes, it's that milder blend of Kentucky Burleys you've admired in other men's pipes. Well-aged, slow-burning, cool on the tongue, fragrant on the nose. It's so much milder to smoke and better to smell that you'll both be happier when he tries it. Buy him a tin this very day!

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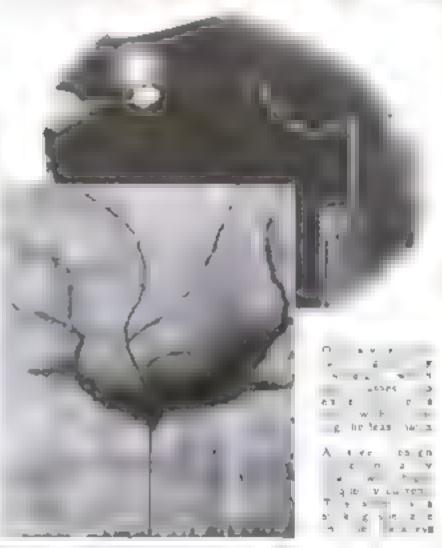
It's 15#-AND IT'S MILDER



frequency coil and its Associate apparatus (P S. M., May '55, p. 32, and July, p. 32) will be used for the purpose of illustration in this article

The 110-rolt line current is stepped up to approximately 1 000 voits by means of the transformer. The high voitage current flows from he secondary of the transformer muotibe condensers, which become charged. If

the circuit comprising the condensers, primary of the high-frequency can and spark trap has been properly adjusted, the condensers will discharge across the mark gap with a series of sparks the frequency of which is many times the original of-cycle containing cut-



The high-frequency discharge of the condensers a somewhat analogous to the swing of a pendulum. The of-cycle current that charges the condensers may be altened to the single motion required to start the pendulum from rest and as the swing of the pendu'um will gradually deminish until it comes to a standatili, so will the strength of the discharges from he condensers across the spark gar, gradually diminish until the condensers are discharged. These rapid discharges from the condensers occur between the peaks of the 60-cycle charging current, and in a properly adjusted tircuit they in no way thterfere with the charging current Where a rotary spark gap is used, it has the effect of still further increasing the frequency of the spark several hundred times a second. Since high-frequency current travels over the surface of a conductor, or along



How loading coil is connected and, at right, a view of the 30-in high-frequency apparatus arranged for subfittion

the skin of a human being, it may be readily understood why a person may take a high-frequency discharge of several hundied thousand voits and suffer no ill elfects

As the 12,000-volt high frequency correct flows through the primary winding of 1956 high frequency cold, a current is in-

duced in the secondary coil, the term hal voltage of which depends upon the ratio of the secondary to the primary turns. The voltage induced in the secondary coil is proportional to the number of secondary turns, and at a point along the secondary even with the top of the primary coil the voltage is high enough to produce a spark several inches long. To avoid spark ag between the coils at that point the primary coil is tapered away from the secondary.

The importance of properly admixing the high-frequency circuit cannot be too scrong ly emphasized. The author has seen high frequency apparatus where merely adding a portion of a turn to the high-frequency coil primary changed the discharge from a weak, stringy spark to a mass of beautiful long streamers. For greater flexibility and as a means of adjusting the coll to its maximum. output it is suggested that an additional load and coil be inserted between the condenser lead and the primary coil. See to ten turns of bare copper or brase wire wound on a cardboard or wood form 6 to 8 in. In diameter will be quite satisfactory. Any size wire larger than No. 10 will do, and it should be spaced to the connecting lead may be clipped to any turn

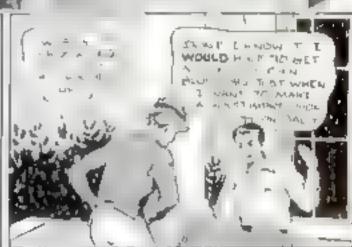
If the stationary electrodes of the rotary spork gap are separated too far from the revolving stude, a spark will occur only in unseon with the 60-cycle charging current, and this may be decidedly unpleasant to take through the body. The proper separation will depend upon the speed of the rotary part of the gap. It may usually be determined by the sound of the (Continued on fore 97)



Might picture of the discharge as it plays freely around and through a common bottle



A new crop
of pimples was
always taking
the joy out
of things!









Don't let adolescent pimples spoil any of YOUR dates!

From about 13 to 25 years of age, important glands develop, causing disturbances throughout the body. Waste possons enter the blood. These irritate the skin, cause pimples. Doctors prescribe Fleischmann's Yeast for adolescent pimples. It clears skin irritants out of the blood, pimples disappear. Bat 3 cakes a day until the skin clears.

clears the skin

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We tried to joke about it

BUT WAS JOE REALLY DUMB



• HIS father and I talked it over after every report cans. Was a seducth? * "Can the try har ex." We tried to joke about it. But its side is fort.

Then his teacher made a manestion "Othersh arentwiselearned have to consen rate by lear one have to type. And date chough, it worked with Joe.

He quickly tramed or type-and or factorised him. Then he started to express himse functions the visit were the first to an cross. Spot anglot passed. Now it a helping with himse himsen. "Joe may never each his class. But it is exclusive no some and concer at the fact the Repongton has be perhaps up. And for that we can never be too grateful."

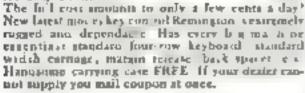
P.S. We really need two!

One typewriter real y can't enough! Dail brings work home to the evening. I we see neal to expend to m' for correspondence of So first on our mouse it of thoughts but you another Remington Portable.

Remington &

As advertised on "March of Time"

You dinevel expect
lo go a sypewriter
so fine as the new
Reministra Portable
for only \$4 slown



MAIL COUPON TODAY

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Please tell me how I can buy a new Remanton Portable for only \$4 down. Also enclose extalog-

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Address	
G(b	New York

MODEL PARTS SOLDERED WITH LIGHTER FLAME



Using a cigarette lighter and paste solder to fatten limbs of ship-model suchor chains

Dilitearst soldering operations such as are often required in model work may be done quickly and neatly with the aid of an ordinary pocket digarette lighter and solder of the low-melting, mate type. Cham links and rings for anchor change, for example, may be soldered in this way.

LOOSE SHAFT COUPLINGS REDUCED BY SHRINKING



How the coupling, after being heated to set up so that little or no water will run inside

IN OVERHAULING shop, factory, or connue installations where shall couplings are
used, a machinat often comes across a
coupling that is a few thousandths of an inchloose. Fitting a new key will only make matters worse, uspecially if the shaft turns at
lugh speed, yet to bore out the coupling and
make a bushing to be pressed on means much
extra work. Shrinking the coupling will instally accomplish the same result. In fact, the
writer has reduced steel couplings 6 in, or
larger in size as much as 1/16 in, at one opera- on

Heat the coupling to a dark cherry red in a slow fire. If it is more than 1'64 in, too large, best it slightly longer, but take care not to "scale" it. Lay a piece of asbestos a little larger than the flange diameter on a faceplate or any flat surface. If the coupling is comparatively small, have ready another piece of sheet asbestos to fit on top; this can be weighed down with any stock casting of a size to serve as a cover. Also have a water hose bandy

Pick the coupling out of the fire, brush off any coal or dust on the flange, and lay it on the sheet asbestos. Place on top of it the small facte of asbestos and the weight. Then play a little water all around the outer surface, beginning at the top and going down. Take tate that as little water as possible runs inside the coupling. If the coupling does not shrank sufficiently, the operation may be repeated.

When reboring the coupling, take a light cut off the face of the finner as the heat may have warped it.—A. W. Loresse.

"AFTER YOU. SANI-FLUSH!"

I set of any anti-freeze should follow a thorough elemang of the rail ator, feet rid of accumulated rust and sediment that clog up the delicate tubes. Flush out the lame deposits that interfere with the efficiency of the cooling system.

You can do it yourself, in a few minutes, for two cruts, Just poor Sam-Finsh in the radiator. (Directions are on the can.) Run the meter. Dram, finsh and refill with your anti-ferese solution. That's all there is to it. And you can have an easy mind all winter. Sant-Flush is thorough. It is perfectly safe, Cannot harm aluminum cylinder-head, block or fittings. Sold by grocery, drug, and hardward storm—10 and 25 cent sizes. The Hygienic Products Co., Canton, Ohio.

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GUARD EASILY ADDED TO UNPROTECTED JOINTER

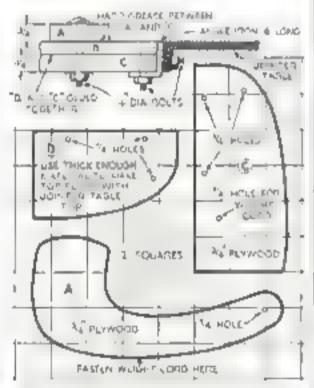


The wooden guard covers the jointer cutter swinging out only enough to let the work by

RATHER than risk one's fingers working with an old-fashioned or unguarded jointer, it is better to take an hour's time and make a wooden guard that will cover the part of the blade not in use. A simple way to do this is shown in the accompanying intestrations. Note that a length of such cord with a weight on the end is used to supply the perssure necessary to keep the guard against the work at all times. This also holds the work against the guide, which in turn makes operating the jointer much easier as well as less dangerous.

In the photograph, a brace will be noted on the piece A. This is not necessary, however, if plywood is used as suggested in the

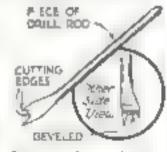
drawings.-J. P Kwire.



Patterns for cutting the three parts of the guard and a view showing method of essembly

EXTRA LONG WOOD BITS MADE FROM DRILL ROD

WHEN AR CIpertally long bit in required for boring wood, or a small bit of some unusual stae, it can be made from a piece of drill rod as shown. I have made bits of this type as long as 18 in. for use where a shorter une



Improvised wood bit formed on sad of rod

would not serve the purpose. They are held in the chuck of a sathe. In making bits of this kind, the point should, of course, be in one with the center of the rod as indicated in the drawings, so that a true hole can be bored. → JAMES H BEEBER.



 "Could push of course. The better they are, the better the work. But I've seen some mighty fine work done with only a few tools that dein't cost a furture. They were kept in perfect shape though sharp. keen cutting. That le essential and it's so much more fun when you keep your tools perfectly emplitioned. The results are so much more satisfactors.

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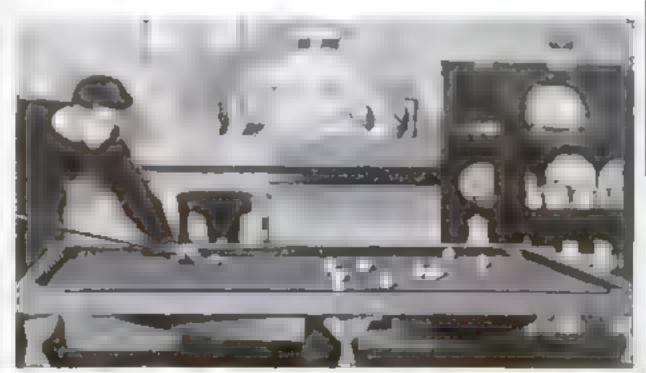
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PLASTIC WOOD

Golf-Ball Pool Table

Can be set up on any large dining-room table—Rubber cushions are not required



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CRACKS

HANDLES LIKE PUTTY— DRIES TO HARD WOOD

Seale shelving, drainboard cracks, resets loose bathroom fixtures, loose tiles, cracks around bathtubs, loose handles, broken furniture, replace wood rot, fill old nail and screw holes, loose drawer pulls, repair leaky window frames, broken balusters, auto tops, loose chair rungs, uneven legs, broken toys, under paint, boat and canoe repairs, and 1001 other uses.

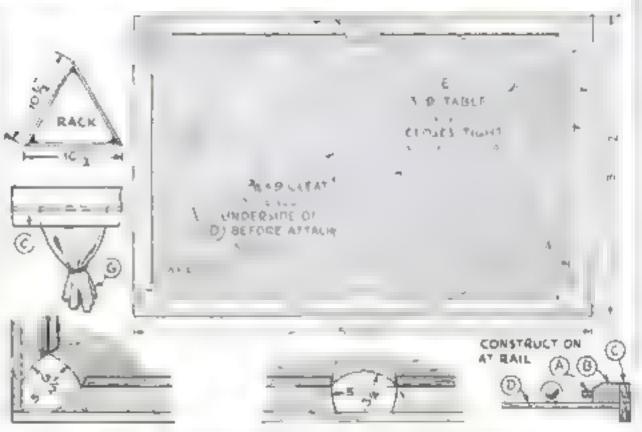
FOR PERMANENT REPAIRS USE THE GENUINE

Genuine Plantic Wood is actual wood in putty form, when dry it is hard, permanent wood that can be worked with any wood working tools, can be sawed, planed turned on lathe, carved—will hold nails and screws without spicture, cracking or crumbing. Genuine Plantic Wood adheres to any clean, dry surface—wood, metal, stone, glass or porcelain—can be painted variashed and tacquered perfectly—is water-proof, weather-proof and

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PLASTIC: WOOD



Now the guil-ball pool table in constructed and used. It has a clear on the unders do that his between the opened halves of an ordinary round during room table. The cushions marked A are of hardwood matead of pubber, and the playing surface is covered with an old highlet

FAST and accurate game of pool can be played with golf bails on the hometrade table top illustrated above. It is inexpensive and easy to construct, has no rubber cush rous to deteriorate, and requires only an average size dining room or kitchen for space.

The original top, which has a playing surface 3 ft. 5 in. by 5 ft. 5 in., was built to suit a dining-room table 3 ft. 9 in. in diameter. If your table is a different size or shape the dimensions must be aftered, but the same construction of rail and pocket can be followed.

The parts marked A are 1/2 by 3/4 in.

hardwood, B, 1% by 2-in. pine; C, 1% by 3-in. pine; and D, 34-in. plywood. The dining-room table is represented by a dot-and-dash line and marked E. The felt is indicated as F, and the felt pockets as G.

Fasten A, B, and C to the plywood first, mitering A and B at the corners and gluing and acrewing all accurely. Then to mark the pockets, either trace around a template made from sketches or lay them out with a compass directly on the wood. Saw down through A, B, and D to form holes for the pockets. The cushion at A should be of hardwood and not more than 1/4 in, above the plywood.

The cleat underneath should be at least

34 in, thick and 9 in, wide, It is attached with flathead screws, down through D and

up through B.

An old blanket dyed green makes an excellent bed. Attach the cloth to D with either knoicum paste or automobile running board cement. Be sure to roll out all wrinkles. Slash the cloth at the pockets and glue it up underneath. I used the same material for pockets, having them sewed up in the form of sleeves about 5 in. in diameter and 10 in, long. Tack one end under each hore and the the other end 2 m. from the bottom

A piece of padded weather strip tacked in the puckets directly opposite A and pieces of green cloth tacked across the top of the pockets will kill all rebound of the balis at the pockets. Angle from in the corners will help stiffen the table and make it more durable

All expused wood should be sanded and stained dark red. Add two coats of wax or varnish, and you have a pool table to

be proud of

At a sporting goods or chain store, you can buy practice golf bolls, often for as attie as len cents each. Get sixteen of these and stain one black or red to be used as a cue bad

An easy way to make a strong rack of 32 by 1-in, hardwood is to build it around a triangle made of 1-in, wood, each side being 01/2 in, long. Glue and brad the corners only, and when the glue is dry, cut away the centerpiece to leave the rack as

shown in the drawing

You will probably want three or four cues. Make these of any straight-grained hard wood 4 ft. long and tapering from 11/4 in straight down to 1/2 is, at the tip Sand these well, stain any dark color, and add leather tips, which you can buy for a few cents from any dealer handling pool supplies.—CHARLES H. McINTOSH

DRILL CASES MADE FROM OLD CARTRIDGE FUSES

A convenient case for holding a variety of smal, drills and bits can easily be made from a renewable cartridge fuse of the type having ends that screw on. All that is necessary is to remove the insides of the fuse and solder up the slot in the end of each screw cap.

In certain larger fuses where the slotted disk is hose, a new disk can be cut from copper or brass and soldered in place When soldering the disks, it is advisable to file the end with cotton waste or a rag so as to protect the threads, otherwise the so,der may flow in and fill up some of the threads.-W T BANTER.



Old cartridge force of the type having ends that screw on may be used for boiding drills



WILIT! See through Steel? IMPOSSIBLE, YOULL SAY_BUT.

T CHALLENGES belief-hat every day at the Gillette factory the umazing electro-magnetic lester "sees" deep brugath the surface of Gillette "Blue Blade" steel. A sample from every coil of steel—the finest the world market affords in submitted to the secretific testroment.

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I LIKE WINTER DRIVING

Gentlemen:

I get lots of fun out of driving when the snow is on the roads. It's a shame so many people miss that pleasure, They should learn, as I did, to change to Quaker State Winter Oil and Greases before the first freezingthen they'd never have to worry about weak batteries and stiff gears

I learned my lesson early last Winter when I bought a two-gallon can of motor oil. and thought I had a big bargain. I used this oil for two weeks and then checked it To my surprise it seemed like so much water!

Believe me, I hat-footed it for the nearest Quaker State dealer, and had the crankcase filled with your Winter oil, Now, during the cold wenther, the motor starts as easily and rune as emoothly as it does in June.

Very truly yours,

D# H. Cadyan

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OUAKER STATE WINTER OILS

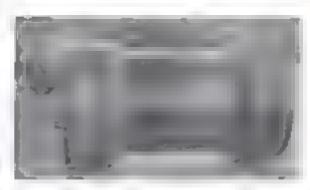
Retail Price . . . 35c per quart Quaker State Oil Refining Co., Oil City, Pa.

AQUARIUM AERATOR USES AIR FROM GAS STATION

AQUARIUM air pamps are usually quate expensive and beyond the mourtet of most amateur mechanics to construct, but a simpler type of aerator may be easily made Furthermore, it requires no expense for operation or upkeep.

Obtain a 10- or 12-in, length of 3-in, pipe (the longer the better) and two caps for the ends. Your local plumber can provide these at small cost. In one cap drill and tap a hole for a small air valve or stopcock such as found on old steam radiators-one that can be turned on and off by hand. Make sure that when the valve is in the "off" position, it is perfectly air-night, it must not leak air under any circumstances

About I in from the first hole, drill and tap another hole for a valve removed from



The sir is stored under \$5 or 100 lb. presaure in a minieture tank made from 3-in, pipe

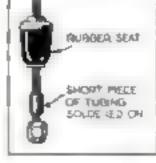
an old automobile inner tube. If no tap for this valve is available, a clearance hole may be driffed for it and the valve securely soldered into the cap. Let the top of the valve protrude about 14 in. The tire valve should be far enough away from the stopcock to allow the fitting from an air hose, such as found at all gasokne filling stations, to be applied to it. The pipe caps are now securely threaded on the pipe, and the aerator is ready for 6.hng

At any passine filing station, fal the container with air to a pressure of 75 or 100 lb Then, by running a rubber hose from the stopcock into the squarium and opening the valve ever so slightly, a steady stream of air sufficient for even the largest tanks will flow for severa hours. I sen intermittently, an aerator of this size supplies a 10-gal, aquatium for about one week before requiring to be detached and refilled

A glass tube drawn down to a fine opening and inserted in the end of the air bose in the aquarium discharges a stream of small bubbles and renders the device considerably more efficient.-W J. Kutchell.

BROKEN FAUCET PLUNGER REPAIRED WITH TUBING

WHEN the inper pronder or stein on a faithtub fautet broke recent y a new one could not be obtained at once. Lacking a not dies I nevertheless made a rapid emergency repair as fourwrs.



A short piece of tubing was expanded by driving a large spike through it. The each of the broken plunger were then supped into this and soldered in place. The repair was still doing duty when the new plunger arrived by mail several weeks later —A. L. JACKSON

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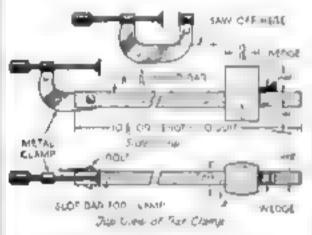
MINIATURE BAR CLAMPS AID IN MODEL WORK



This model of a bouse in being glund with the aid of two amail homemade bet clamps

Miniatt RE has clamps for gluing models and other light, delicate work are easily made as shown in the drawing below. The head of each bor is made from a ten-cent C-clamp of the pressed-steel type. All that is necessary is to cut off the fixed end of the C-clamp, drill a hole for a boit, alot the wooden bar, and fasten the clamp in place. The two halves of the C-clamp flare out and give a bearing so that it won't turn outward when pressure is put on.

Innumerable uses will be found for a pair of these clamps,—T. B. O



A present-steel C-clamb is festined at one and, and a older block used at the other

HAMMERS KEPT HANDY IN ANGLE-IRON RACK

A 3 by 3-in, angle with boles of various sizes in one flange may be boiled to the edge of the workbench as shown for hording a variety of hammers, cold cuts, and other handled tools. They are thus kept out of the way and off the working surface of the bench, yet are easy to get at.—Joseph C. Coyle.



Strip of angle from at end of bench with a number of holes for hammers and other tools



NEW 1936 model 91," t 3" "Workshop" Lathe with Horizontal Counter Shaft, 4 59828 h.p. Reversing Mater, Reversing Switch and Selling as shown (\$155.00 Doors, \$7.66 a March for 11 Months)

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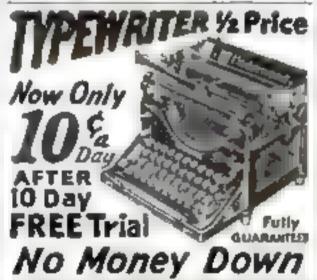
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WHITTLED FIST FORMS NOVEL DOOR KNOCKER

THIS decorative wooden door knocket is carved or whitsled in the shape of a conventionalized or simplified fist. All that is required is a piece of wood 1½ by 3 by 4½ a. a. a 1-an, but thinge and screws, and a pair of the small, hardened steel caps or glides that are

ordinarily used on chair feet.

The block is laid out in byen squares on one wide face, and the pattern of the hand is traced by copying square lot square from the drawing The hand shape is then sawed out The back face is whittled or thiscled on a taper from both ends toward the wrist, so that the wrist is 4 in below the back surface, as indicated in the side

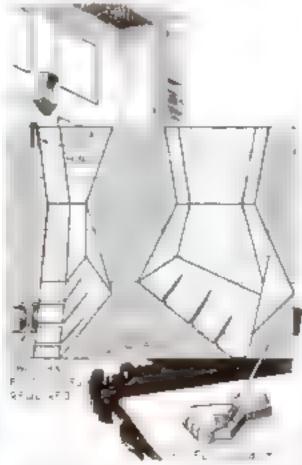
Conventions treed hand easily made from wood

The fist is formed by tapering from the knuckle line to the middle joints of the fingers until the lower edge is on y 1, 10 thick, and from the knuckle has back toward the wrist unto wrist thickness is only 2, in The thamb is formed by cutting straight across at the edge of the index finger saving the thumb extending out to the right and only 1/2 in, thick. The udes of the wrist are then chamfered as indicated, and equally spaced notches cut in to indicate the finger. The wood may be stained or left natural and finished with litisord oil, or it may be painted.

The bust hince is put at the top of the cuff and the gode is fastened at about the center of the back fare of the hand. Screw the hand to the door, then put the other gode on the door so that they stake together when the hand is

afted and dropped.

A similar design may be used as a holder for a desk pen. In this case the socket for the pen is inserted in a hole drilled at an angle between thumb and foreinger, as indicated in the sketch, and the underside of the hand, instead of being hollowed out wightly in left that and covered with tell. E. J. Taxcamman



Two views allowing how to lay out the wood, and sketches of door knocker and pen holder









MEW ICE-BOAT Belly in 3 Days of AMAZING LOW COSTI

w NPB designations of front streeting."

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PRACTICAL DARKROOM BUILT IN CLOSET



Small darkroom with printer and developing trays. The sais lights are at upper right

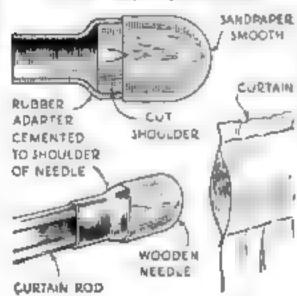
A CLOTHES closet with an available floor space of 4 by 4 ft and only 7 ft buch has housed the author's darkroom artifactorily for more than three years. It is an example of what the amateur photographer can do if thappens that his cellar is too damp for a darkroom, the attic too hot, and the bathroom too difficult to make lightproof.

A bench 12 in, wide was installed 40 in, from the floor for the printer and he developer trays. A shelf was built under it to haid storage bottles for fresh water, stock hypo, and stock developer. A narrow shelf, 18 in above the developing bench, was built for

paper and chemicals.

The entire inside of the closet was painted flat black, and felt weather stripping was applied around the door to give aght protection. To carry waste water away, a copper pipe was fished through the wast to the cellar. A amai, fan was placed near the celling to provide air circulation. Safe lights, made in whoden cases with an asticatos iming, were mounted on the wast at right. Negatives and prints are washed in the bathtub, and enlarging is done at night, with the outside room darkened.—Rogalin L. Ives.

AN EASY WAY TO INSERT RODS IN CURTAINS



Placing curtains or drapes on rods usually is a temper-trying ordeal because the corners and edges of the rods continually catch. This can be prevented by making a wooden "needle" or nose with a rubber adapter, as shown, to fit various curtain rods of different shapes.—Latrance N. Otsen.



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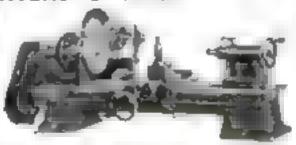
Plugs for Conadian market—75c—made at \$1 Cathorines, Ontaria



Before Cleaning

After Cleaning





Here in a new metal-working lathe ideal for home workshop needs. Has automatic reversible power feeds—modern V-beh drive—9" swing 36" bed 15" between centers percesson around hollow spanile. Plugs into light necket. Does all regular lathe jobs, and for \$6.15 extra you can get threading gears to out from 4 to 7, threads per uch. Each lathe augranteed for 001" precision. Price of \$55,75 (less morpe) pointees.

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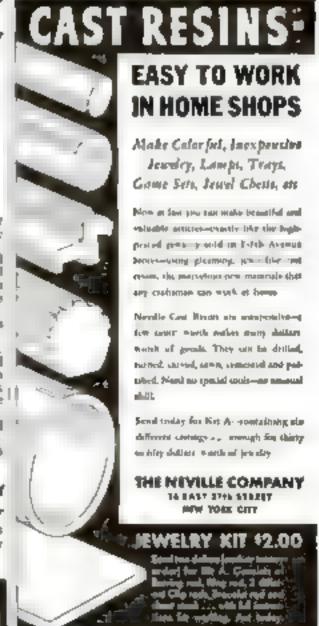
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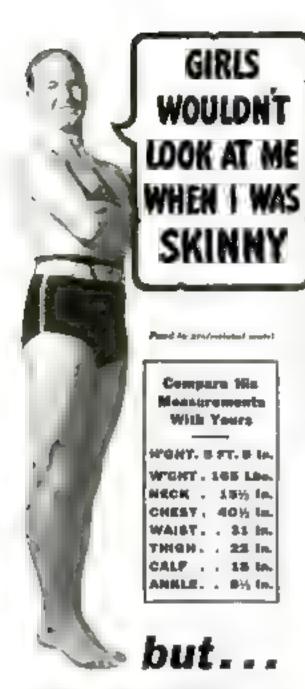
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REALISTIC SMALL BOATS

(Continued from page 65)

next plank will come, and cut a plank to he along the marks. You will notice that by cutting to a smooth curve that hits these lines, the planks win curve up at the ends as requared. This second plank is glued to the first Marks are then made for the next, and so on un a all are on.

When you have the shape right for a plank on one side, cut another to go on the opposite. side and fix that before proceeding to the next. If you are making several boats of the same shape, cut enough planks for all from the puttern you have made. I found that a rellulose tement was the best for this work because it dries to quickly, and one can hold the plank in position until set. Nip the ends of the planks in close with the thumb had at the stem and stern and let them remain gloed there until later, when they can be cut to shape with a rasor blade. Let the top strake come a little above its marks. Shave or grand the keel to its proper depth.

Gently work the planking and backbone off the mold and put in the ribs. For these I cut long strips of cardboard about 1/32 in. wide,



Dipping legacile of the type shown in these plans are regulation equipment for bleboats

glued them on one side, and laid them in the boat from gunwale to gunwale not more than 1/16 in apart. Towards the ends they have to be divided at the keel. To belp the boat hold together, I always run some plastic materms or thick give along the mode of the stem and stern, quite a bit can be put in because it will be covered by the gangloards

I made the gunwales (inside the boat) of 1/32-in, holly wood a full 1/10 in, deep. These should be sprung in nicely so as to give a good sheer line. They are glued to the frames, and the ends of the frames and edge of the upper plank can then be shaved level with them

The gunwale (pronounced gun'el) is finished off with a strip of cardboard gloed on top. Lay the boat keel up on a piece of cardboard, mark the outside curve, and from it mark the mode curve, making it the thickness of the plank, rib, and gunwale Cut it to that shape

At the thickness of the thwarts (seats) belaw the gunwales, give other strips of wood about 1/32 in, square for them to he on. These are the risines

Along the center line in the bottom, a very thin strip of wood is glued for the keeison, and on each side are glued corved strops of cardboard for the bottom boards or footings In the stern sheets is placed a little grating. also made of cardboard

Paint up to the risings gray or other suitable color except the grating, which should resem-

The thwarts should be a bare 1/32 in. thick and 3/32 in, wide Set them temporardy in position, being careful that they are of the right length to preserve the proper width of the boat. Now make the bow and stern gameboards (platforms), getting their shapes by trying out with slips of cardboard. Holly is a good wood for all this work. Glue everything in position and, if you wish, make three-coraered kness running from each thwart to the

Adding a rubber at the lower edge of the top strake is an improvement. For it, glue on a very than piece of braided cord or a slip of wood. The latter is better

A board to sup- (Continued on page 93)



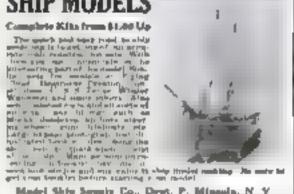


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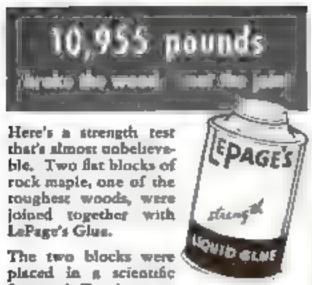
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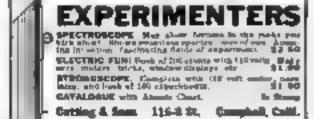
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REALISTIC SMALL BOATS

(Continued from page 92)

port the mast and a step will be required, and a hook at either end for the tackies. The hooks should bolt under the keel, but this is difficult, so they are made of small pins with the ends bent up under the gangboards.

The whole boat may now be painted the required colors, but be very careful not to rain

it with gummy point

I made the navy whaleboat shown in a slightly different manner I curved out a boat to the dimensions as given on the Hartford blue-prints, then slit it in half and googed out each half as thin as possible. This can be done so thin that you can see large print through it As these boats have a large steen locker, I left that part solid. I then planked such half, as before, but glued staff writing-paper planks onto the shells. I then cut a keel, stem, and stern backbone of a width to extend the right amount and fill up all the space between the two halves. This can be found by laying one half on the material and marking from it

The two halves are glued to this, and the ribs and other interior fittings applied. I made the top strukes thicker by using cardboard, and gave the boat cap gunwales only

"IIIS method sounds a lot easier than the other, but by the time one has gouged out the halves and shaped the planks, there is not much difference in time or care, and, of course, the hoat is a shade thicker and does not show the planks inside

The cutter I made in two halves like the whateboat, but instead of putting on planks, cut them into the wood. To do thus, curefully mark each plank With a knife, make a shallow cut along each line, and use a chuel to cut away a shaving to each line from below, dashing up with a little file. This plan is easier,

but never quite so neat

For reference, here are the actual measurements of some of the principal parts of a merchant shap's 30-ft. boat: Keel, 6 by 36 in , planks, 55 by 5 , in. with 'a in landing or overlap sheet strake of a bardwood, t.mbers (rabas, 1 by 1 , to, set 6 in, apart, thwarts, 134 by 9 in , rudder, 134 by 19 in , mast, 19 ft. Jone, A 20-ft, boat would have 15

There are of course, other ways of making bonts. One can carve them from the solid, hollowing them out and cutting away to leave the stem, stern, and keel. This will serve for very small boats, but for anything over about 2 in. it realty gives more trouble than the other

Excellent boats can be made on a mold with streps of thin paper souked in casein give and sandpapered. This is the best plan for carvel-built boots, but they can be planted as described here for the whaleboat

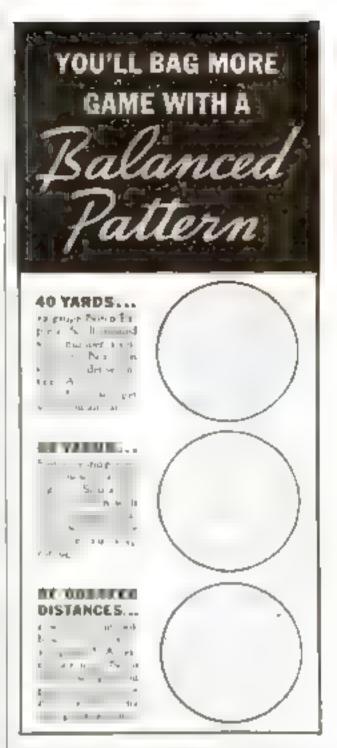
Boats can also be made from plastic material, using an outside and inside mold. These books are difficult to get smooth and are frag-

ile and tiable to warp

The methods described are all for lapstraked or clinker-built boats. Smooth sided. carvel-built boats or steel boats are much easier because one does not have to show planking. The carved wood and give-soaked paper methods are best for them.

A well-built boat rates some equipment I suggest at least a full set of ours (blades always forward), a rudder, and a painter (bow cord) To these, if scale permits, should be added a mast and sail (the sail will be made up on its boom and have a painted cauves cover), boathooks, tiller, tuwlocks or thole purs, water breakers, and other equipment and on the outside of lifeboats, the life lines or grab ares. All equipment must be lashed to

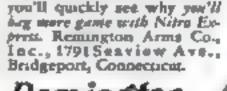
A ship's boat should have the name on each bow and the name and port of registry on the stern.



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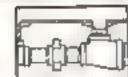
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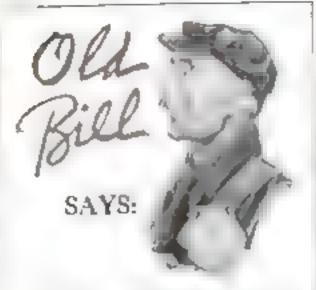
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WHEN chatter occurs an lathe or mill-ing machine, try easing the feed, not lowering it. The secret is to keep the tool against the job by placing a slight "againg" su tool or arbor.

Diegunte symptoms peaperly. Too mack surface speed burns the custing edge of tool Too much feed breaks down the entitive edge.

In milling reamer flutes about sparing flates evenly. Evenly spaced rutting edger in ecomera cause them to "track," and they won't function properly.

If smooth, cound hales are desired, use embon steel, rose-type requires without peripheral circonace, and preferably resmers with a left-head or negative spiral finte.

When using a transfinte shear-ent or gun tap in a blind hale, drill the hole excep-Hunally deep to provide clearance for chips, which are pushed forward into the buttom of the bule by this type of top.

Refore mounting a militar cutter on an arbor, be sure that the sides of the arbor collars are parallel with each other and free from dirt and barrs.

A little complue placed to the tool box will help keep tools from rusting.

ADHESIVE TAPE MAKES V-BELT LAST LONGER



by a sarall. V-belt becomes worn and ragged from long use, its life can be prolonged somewhat by refacine the oner surface with a strip of ordinary surrect, authorive take. In order to apply the tape it is pressary to bend the belt as illustrated Be sure to make a smooth joint where the ends of the tape meet. After returning the belt to the machine turn the latter by hand several times so that the tape will sest used correctly.—C. L.



perione of A.M.C. of Tajange, Cabifornia, who writest "I have a coffee table of teak wood and a small Both of home with six ego and tweeve glaced joints. I have tried both bor accorded glace and three arms of marine coments, but all would loosed in from all to twelve months. I is about eighteen months ince I gave them at bergic country of CASCO We reproof GLUE. Today they reas good as new in space of the fact that that Hunard is the absolute limit for wood strinkage!"

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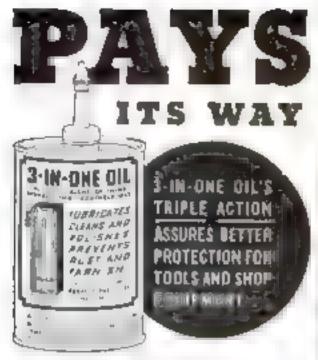


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ing pen -Ground A SMATE

WEATHER-VANE BEARING MADE FROM CASTER

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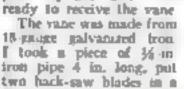
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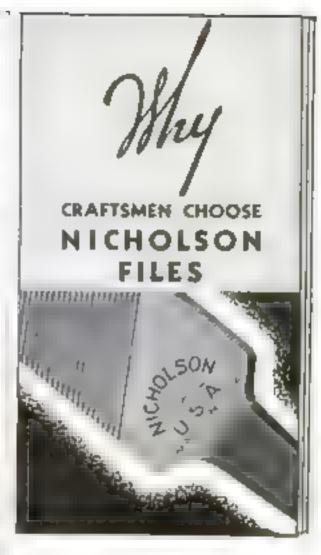
REDUCEAL

TO MAKE an efficient weathervane bearing with out a lot of work. I used a roller bear ing caster that came from an office chair After removing the wheel, I slipped the taws over a 15-in. pipe coupling and dulled and tapped for 1 lo-in stone boots where the bales of the jaws came. to secure the bear ing to the coupling This left the tail piece spright and



frame and sawed a slot lengthwest of the pipe for 2 in., and pressed this on the vane, riveting it securely. A plate with a hole in it was slipped over the pipe, as shown, and soldered to the bottom of the rooster. This plate and the metal between the legs were painted leaf green, and the legs were painted yellow. In this way the necessity of making separate legs was avoided, yet from the ground the appearance is quite natural

The collect or socket of the caster, which had been originally pressed into the leg of the chair, just fitted the ½-in pipe, so all I had to do was to press this into the pipe and put the tailpiene into the socket, after wrapping a piece of tin around the tailpiece to make it lit. I then drilled through the pipe and tailpiece to receive a finishing easil, which I used for a rivet I oiled the roller with transmission greate. The wave works perfectly in the lightest breeze.—N. F. Powers.



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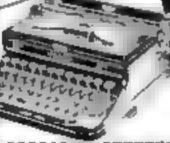


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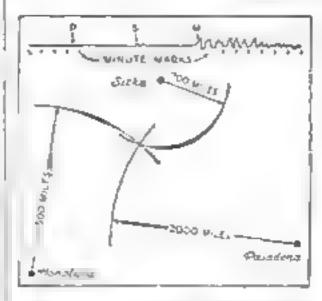
STREET

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SEISMOGRAPH RECORDS DISTANT QUAKES

(Continued from page 67)



Three-station method of computing location of an earthquake Each station calculates. the distance by the variation of the wove tions then scale radio are used to strike ares, als of which intersect at the spiteniar

blocks, which in turn are held upright by a base board. If the drum is rotated, it will be drawn endwise corresponding to the lead of the screw, and thus a continuous line is traced by the stylus. Driven one revolution per bour by a small electric clock, the paper will last several days without changing

Block up the clock until central with the tubing. Remove the hands, and attach 6 radio universal joint to the hour-hand shaft. To the other side secure a steel rod 1/4 in, square, buying its other end thrust through the shaft washer, thus providing a drive for the drum, no matter what its endwise position.

*HE drum assembly must be blocked up to each a height that the drum is a little below the level of the extension arm tip.

Friction between the styles and the paper on the drum must be reduced to a minimum. and this is accomplished by the use of a counterbalanced needle. Cut a match stick 1/2 in. long, cut two small sewing needles in half, and put the pointed halves in the ends of the stick. Run another small needle through the center of the match so that a cross will be formed. It is the point of this needle that traces the line on the smaked paper.

For pivot bearings, make a small hole in each side of the Y with an ice pick, and screw in two clock balance-wheel cups. Mount the styles pivot between them. After a few trials the tracing needle can be balanced so that the point will sest very lightly on the paper

Highly glazed paper, such as enamel finished book paper, should be used for the record, since its smooth surface will hinder the movement of the needle but little. Almost every printing shop curries some in stock. Use a kerosene lamp to sunks the paper, turning the flame high and holding the paper above it until a black deposit of soot has been deposited.

Sometime during the recording, mark the position of the stylus at 12 m., so that time ran be reckoned from it. After recording, fix the sheet by spraying it with a solution of six parts alcohol to one of white shellar, and use it as a negative, if desired, for printing the permanent return on photographic super-

The sessingeraph, of course will register only shocks that vibrate somewhat out of the plane of the post and arm. To receive quakes from all directions, two instruments should be built and set up at right ungles to each other

When there is no disturbance, the pendulum will remain stationary and the needle will trace a straight line on the smoked paper at it moves beneath it, but when waves from a distant quake pen beneath, the peedle will swing from side to side, sometimes less than 1/2 in., sometimes 1 or 2 in Large or small, each line will create a desire to learn more about the science of seismology

HAVING obtained a record, you will want to know the distance and location of the earthquake. The distance can be estimated fairly accurately. Avoiding technicastics, it may be said that three main waves emanate from the usual shock. The first, or primary (P) wave travels (asyest A slower secondary wave (5) comes a little later, registering on the paper, and later still a third, or main (4f). wave. They start together, and diverse more and more as they travel from the source, and their rate of travel has been measured. That charts have been prepared that show from the tune-separation of the recorded waves the distance to execenter, or the area of ground immediately above the disturbance

The location of a quake is learned by ob-tuining a card from the U.S. Const and Geodetic Survey giving the data, or it can be computed from the records, as illustrated in the

PHOTO COLORS DYE WOOD

WHEN a rare wood of some special color is required for inlay purposes, but cannot readily be obtained without considerable frouble and delay, white woods of a similar grain structure can be easily dyed to resemble it ressonably well.

FOR SPECIAL INLAYS

As a source of dye, the writer has often made use of the transparent water-color stamps sold in booklet form for coloring photographic prints. These booksets are inexpensive, contain twelve different colors, and can be bought at any photo supply house. Dissolve portions of the dye-coated sheets in alcohol to match the color destred. Immerse the wood in the dve solution for a length of time depending upon the penetration desured. The wood when dried is ready to use

Novel effects may be produced in some woods by incomplete dyeing When the veneer in dried and sanded down, beautiful strictions of color are formed.-W K.

(arionettes

Many requests have been received for more articles on puppets since the publication of "Practica. Marionettes Made from Old Inner Tubes" by Mrs. Florence C Drake (P S. M., Sept. '35, p. 58) We are glad you enjoyed that article and appreciate the suggestions you have made for topics to be covered in future articles. A senes is now being prepared by Mrs. Drake, It will contain a large variety of nimple ways to make marsonette heads and bodies, animal puppets, and stages, The first of these articles will appear in the December issue. Watch for it'

Preview for tool lovers



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Product for workshop to down

STYLES & CASH. Inc. D WEST 436 SPIESS MEN FOR OTH

HIGH FREQUENCY STUNTS

Continued from page 87,

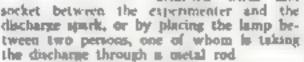
spark. When a pure musical note is given off by the discharge across the gap, the adjustment may be considered correct. The maximum separation between the gap elements should not in any case exceed 1/16 in.

When operating high-frequency apparatus for the first time, especially in broad daylight, the experimenter is apt to be somewhat disappointed with the results. Only the strongest sparks will be visible in a bright light, and the beautiful brush discharge was be completely lost. Some views of spectacular might displays are shown. Of particular involving wire described in the May issue

If a small branch of a shrub or tree is fastened to the discharge rod of the coil, it will wilt and collapse almost immediately after the current is turned on. If the discharge is continued, the branch will burst into flames within a few seconds. If a dry, well-seasoned board is placed against the

> docharge rod the spark will branch out and nowly creep to the top and sides of the board. At melit the spectacle appears tike a luminous tree slowly taking shape before the spectator's

A stunt that never fails to mystrfy the layman is the lighting of a lamp with the current flowing through the lamp Ato the body may be performed by holding a lamp with attached wires and



jacob's lander pro-

duced with the bigh-

voltage transformer

A neon-gas tube will light up weirdly it held within several feet of the spark. Out-lines of figures and letters, if formed from a continuous piece of wire and suspended in the air with string, will glow with a strange blue light when the end of the wire is connected to the discharge rod

Another interesting experiment may be performed by lighting a torch with the spark The torch may be shaped from a piece of wood one end of which is hollowed out to hold the burning material. A bare wire should extend from the hollowed end to the part that is held in the hand. If the hollowed end is filled with cotton waste or bits of cloth and brought near the spark, it will immediately burst into flame. The effect may be enhanced by previously saturating the waste or cloth with kerosene

Ordinary insulators become excellent conductors for the high-frequency discharge. If a glass buttle is placed over the discharge rod, the sparks appear to meet little or no resistance in passing through the glass

Some interesting stunts may be performed with on v part of the apparatus. If the highfrequency coil is removed from the circuit and a coil of insulated were connected in place of the bigh frequency coil primary an interesting demonstration of electromagnetic induction may be given. A second coil is made, to which is connected a socket or receptacle. The diameter of the coils may be any size that will hold its shape, and each coil may consist of from four to ten turns. If a lamp is placed in the socket and the lamp coil brought near the stationary coil, the lamp will light brilliantly when the current is turned on. If the lamp coil is moved back and forth before (Continued on page 98



Carving dolls is fun-says Tony Sarg

"HIS grompy "Duchess", curved by Tony Sarg, has amused thousands who have seen his Marionette show, Alice in Wonderland.

In her school in New York City, anidence learn to carve character heads.

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you the hows and whys of science series. If you did, we know you are Now Paramount pictures shows impatiently awaiting the second. If you didn't, you've missed one of the movie treats of your life. Above are scenes from the second picture. If it isn't already booked for your neighborhood theatre, ask the manager to get it. "POPULAR SCIENCE" is one of the "must" pictures of 1935.

HIGH-FREQUENCY STUNTS

(Continued from page 07)

the stationary coil, the extent of the magnetic field may be readily observed. Since the action of the coils is similar to a transformer, the experimental may vary the number of turns in each coil and note the various dis-tances at which it is possible to light the lamp. In this experiment all connections remain the same as when using the apparatus for a high-frequency demonstration except that the Iwo leads that formerly went to the primany of the high-frequency coil are connected to the ends of the stationary cuil.

By attaching two bare wires to the terminal posts of the high-voltage transformer, the novel effect of a Jacob's ladder may be produced. The wires are arranged so that they come within 1/4 in of each other at one point, then alant upward and away from such other at an angle of about 45 deg. to a height of about 10 in, from the point of closest separation. When current is applied to the primary of the transformer, an are will form across the points of least separation, and will then climb upward until it reaches a gap of several inches, where it is extinguished, only to be followed by a sense of arts as long as the current is on

Although the discharge from a high-fre-quency coil may be taken with no ill ef-fects, the spark should not be allowed to play on the hore skin, otherwise a panful burn may result. If the spark is taken through a metal rod held in the hand, the possible y of burns is eleminated. Caution should be exerched when working around the high-vol age transformer circuit, or when performing experiments requiring the transformer glone,

GUIDE FOR RESAWING A BOARD BY HAND



A groove cut around all four edges on a circulor saw serves as a guide for the head saw

BOARD can be resawed by hand into A thinner pieces when becessary by the method illustrated above. To guide the saw, it is necessary merely to make a saw cut all around the edge on a bench circular saw, setling the gage so that the cut comes exactly in the center of the edge. This cut serves as a guide to keep the hand ripsaw straight. A small piece of wood or metal the thickness of the saw kerf is put in the cut at the point where the board is clamped in the vise to fill the groove Roblet Prices.

HOW TO SAW STRIPS FOR INLAY AND MODEL WORK

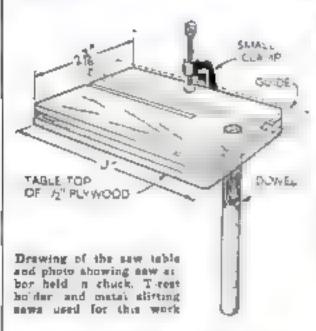


Used in a lathe, this homemade attachment saws wenner accurately into narrow strips

A SMALL lathe can be easily equipped with a miniature new table for ripping veneers into very narrow strips for inlaying or model work, A piece of ½-in, plywood forms the top for table, and a piece of dowel is glued into it for the support. The dowel stick should be of such diameter that it will fit the T-rest holder of the lathe. A saw cut is made in the back edge as shown. A strip of wood held to the top of the table by a small clamp acts as a guide

The photographs show 2 in diameter metal slitting saws. These are placed on an arbor, and the arhor in turn is held in the lathe





SODA-STRAW PIPETTES

For the microscopist who does any work with protozoans or bacteris, one of the most irksome duties connected with his hobby is that of washing glassware, particularly pipettes. In addition they are constant y being broken. These difficulties may be done away with by using, instead of lengths of glass tubing, cellulose soda straws. The cost is trivial and, after having been used once, they may be thrown away. Two or three should be kept on the instrument table; the remaining supply may be stored in a large, tightly capped bottle.—RICHARD H. SMITH

CRITICAL MOMENTS NO 5

WE HAD A **PUNCTURE MILES** FROM TOWN"

"Sue and the youngster were with me. No farmhouses! No passing cars! Freezing cold and pitch black! And then when the rim stuck ... boy! Believe me, I was glad I had my Everendy Flashlight in the car."

(Excerpt from an actual letter)

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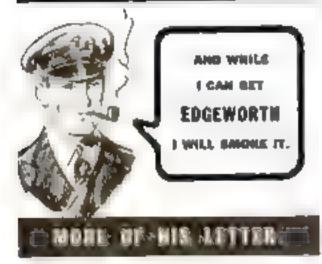
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2nd STEWARD OF S. S. **ASCANIA HAD TO BREAK BOTH LEGS TO FIND FAVORITE TOBACCO**





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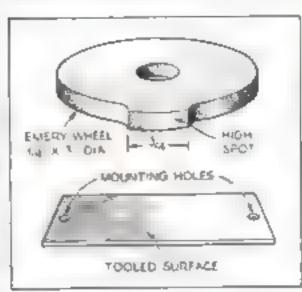
Nearly all offices smalts in in this company. In would surprise you to know just how propoler your tobacco in. While I can ger Edgeworth I'll amake it; and, thank Harren, I am well apough again to get it gryspif. Summe and a guad market to you.

> A. C. Hendung and Steward, 5.5. Accessis

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HAND-SCRAPED SURFACE IMITATED BY GRINDING

A TOOLED surface with a finish that re-sembles hand scraping may be ground on an ordinary surface grinder. The penphery of n 54 by 3 m. fine-grained emery wheel is cut down about 14 in as shown except for one high spot about 1/2 in, long. The work is mounted on the table of the surface grinder and fed rapidly across under the wheel, and



An appearance like espensive hand scraping is given by using a wheel our down as shown

the high spot on the wheel leaves a series of ground patches. The wheel should make a light cut, usually 201 or 202 in. is deep enough The table is then moved over the thickness of the wheel and another row marked on the surface. The whole surface in gone over in this way. Next, the work is rotated 45 deg, and the marks put on at this angle. The work is gone over four times, being turned 43 deg

If a 56-on, wheel is used, the putches should he about 36 in, wide and from 56 to 3/10 in agest for the best appearance. Any material may be surfaced in this way .- P A. E.

CONDUIT STRAPS FORM RACK FOR DRILL ROD



As interensive and serviceable rack for drill rod and similar stock may be made as shown above from coodust straps. To save space, the ends of the straps are overtapped and held with screws. Two straps fastened about 3-m, apart will hold short each of stock. DANIEL REVNOLDS.



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THE PORTER CHEMICAL COMPANY (-1) | Prospect Assum. Hagerstriet. Marrisol



PRECISION THINGS WITH TWO MICROSCOPE

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MIDGET RACING

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Ray F. Kann. Dupt. D-10, Madinauville, Cincianati, Dirio

Always mention Popular Science MONTHLY when answering advertisements in this magazine.

MICROSCOPIC MARVELS IN YOUR GARDEN

(Continued from page 45)

meduliary rays, flor radiating lines formed by layers of tissue between the fibrurescular bundles, are present. It is easy to distinguish between the bark and the woody growth in-

aide the cambium layer

The center of the section contains the deficate pith cells. Drop a weak solution of iodine OF a cross section of such a stem (wanter twig) and a blue color will appear in various parts, indicating the presence of starch The pith, particularly, is used as a ceservoic for the storage of starch as winter food. The iodine test also will show starth in the burk and medulary rays. The colored pattern formed by the test frequently is very beautiful under the microscope

AS THE stem grows older, the chlo-renchyma or former green part of the atem loses its chlorophyll and becomes a part of the bark. The epidermis and collenchyma have changed into a waterproof sheath of cork. Inside the cumbium is the xylem, containing the ducts for carrying water, while outside is the phloren, with the perforated areve tubes.

As the stem matures still further, the camhium produces near wood inside and new bark outside. The wood increases in quantity while the back, by weathering and peeling, remains fairly constant in thickness.

The alternate capid growth of cells in the summer and the complete or virtual cessation of growth in winter causes the gonearance of unnual rings-bands or alreaths of woody cethwhich are large towards the center and small towards the outside. By counting the nanual rings, the age of the stem can be determined

What stem sections in their natural state are beautiful objects for the microscope, their beauty can be increased greatly by the application of stains. Such stains, because of their selective action, will also bring out the various cell groups more plainly. Iodine. mercurochrome, costs, methylene blue, and haematoxylin are but a few of the staining materials you can employ. It is fun to experiment with various combinations

You will discover, before you have succeeded in sticing many plant stems with a razor blade and a piece of cork or wood as a cutting block, that soft stems have a habit of crushing or that the cell formation is disturbed by the pressure of the blade. Often a satisfactory job of making either cross or longitudinal sections can be done with the

aid of elder pith.

Simply split a piece of pith in two, cut a groove to receive the stem, then put the halves together again so that they will brace the atem as it is being cut. You can buy dry pith or get it from elder stocks. You might try freezing the stem, if it is very noft, in a mechanical refrigerator or by immersing it in a minture of cracked for and salt. Do not freeze it too solidly

LABORATORY methods of making stem sections call for dehydrating in alcohol, clearing to aylol, inflatrating with and embedding in paratin, and slight with a microtome. The stices are comented to slides, and paralito dissolved away, the specimens stained, ducil, and mounted in balsam.

If you want to make permanent slides of some of your stem sections, stain them, pass them successively through two or three gly cerin baths of different degrees of dilution with water, and finally through pure glycerin. which is used as the mounting medium. Seal the edges of the cover glass with gold size This method, while not as permanent as the use of Canada bulsam, does away with the somewhat involved system of dehydration. with alcohol-



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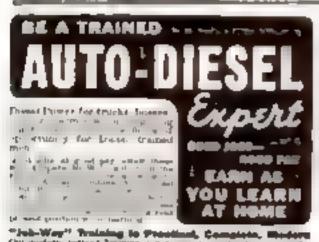
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FIRST OF THE NEW \$5 CONTEST WINNERS

Three peace winning letters in POPU-LAR SCIENCE MONTHLY'S new Secrets of Success contest-"Il hat Home Study Has Meant to Me"-are printed below Read these stones carefully because your own career may be just as interesting and inspiring to other readers. If you think so put it down on paper and send it in. We will pay \$5 for every letter we publish.

CONTEST RULES

Only letters from bonafide home study school students will be considered and these must contain the name of the school and the name of the company, or companies, for whom you have worked since graduation. (Names, however, will be dr leted from the letters when published) We also want to know the kind of course you took and the type of position you have held. Your own identity will be kept anonymous, if desired

We are interested in facts, not literary ability, but please write clearly, completely, and keep your letter within 500 words We are not looking for get rich quick stories or fresk adventures, and authors must be prepared to substantiate the truth of the statements. Manuscripts submit ed and printed become the property of this magazine and we are not responsible for the return of rejected stories an ess sufficient postage is provided for this purpose Address your contribution to Success Story Department, POPULAR SCIENCE MONTHLY, 353 Fourth Avenue, New York, N. Y.

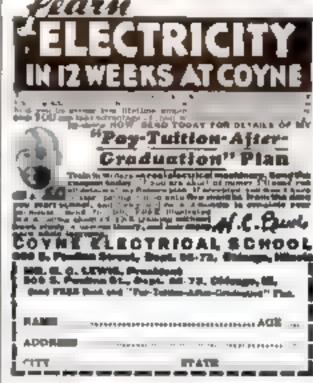
HEADS HIS OWN BUSINESS

After my father's death, I had to drop out of college and become the bead of the family

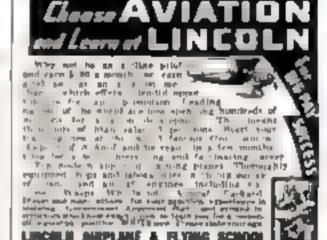
I couldn't afford to take a correspondence school course in the regular way but I did buy a course in show card writing and designing from a fellow (who was through with it) on the basis of paying for it out of earnings

After several months of earnest study and practice I got to seiling some of my work, then worked part time in a large show card and design shop which got me into the largest stationery and printing establishment in Seattle Washington because I could write show cards, dress show windows and do designing of various

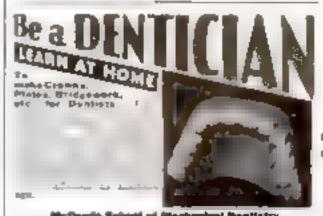
This also made possible a year m night school, and while I later went into specialty selling and advertising for a large office equipment company the hankering for lettering and design never left me and eventually I gave up a job as director of education and advertising with this company in 1925 to start my own business which I still operate







LINCOLN AMPLANE & FLYING SCHOOL 2105 Airproft Bide. Lincoln, Nubruska



of Beatletry of the star

Secrets of Success

We started out to give sign manufacture the same sort of scientific background which applies to other forms of publicity but we are called upon to do all kinds of unusual things dealing with design and manufacture. Our market is from coast to coast, but centers east of Ohio. We employ up to offeen people and, strange as it seems, there isn't a "brush man" in the lot.

All of our processes are mechanical, most of them patented or proportary. Our plant occupies two floors of some 6400 square feet of space and our inventories are more than \$20,000. Our most recent commission of size was the design and construction of the Ohio State Exhibit.

The whole thing goes back to that correspondence course and the long nights I
put in with it. I still have—and occasionally use—that original text book.
That course had more to do with my
destiny than three years of college, although both have been essential. It may
be worth while to mention, too, that some
of the subjects I studied in college and
which then seemed utterly worthiess have
proved to be very "every-day-valuable"
in the work I shall doubtless follow all

HE WASN'T AFRAID TO WORK

my life.—B. M. H., Marietta, Ohia,

In 1919, I came home from service with the A.E.F. to find that my school board employers had lorgotten to hold my place for me. It was up to me to find a job or make one. During my period of war service I had thought at times of new fields of vocational activity upon my return (?) and had about made up my mind to try traffic management.

Almost the first expense after my arrival home in Chicago was to make a down payment on the excellent course in traffic management with Good fortune seemed to shine upon my efforts at once. Approaching a railroad company for employment, a kindly official directed mo to the Central Freight Association.



Recently we have received many letters outlining problems similar to the one you now face.

You had planned on stepping from high school into college. And your parents had planned on it too. But the economic upheaval of the past few years has played havor with countless well-laid plans—and family budgets.

It's traged in a way, but life is an experience of constant changes. In the final analysis we are responsible for our own defeats—and our own victories. No man is our liched who is still willing to fight. And with hope of a courge career gone, you are still eager to fight for realization of your life's dream. You have a fine sport.

You want to be an electrical engineer, You had planned on studying this subject at college. All right, you CAN be an electrical engineer.

Directed home study is the answer to your problem. Maybe you are fortunate and have a job. The answer to your dream hes in the utilization of your spare time. Many of the world's electrical engineers got their starts by studying International Correspondence Schools Courses in their spare time. This is also true of leaders in a wide range of professions.

Our Electrical Engineering Course, as in true of the other 300 courses taught by these Schools successfully for over forty years, was prepared by outstanding authorities on that subject—and is under constant revision. The list of subjects be ow indicates the comprehensive service of this institution—a service that has been utilized by 4,000,000 ambitious men!

Understand, we do not claim I. C. S. training is a complete substitute for a college career. Many college graduates, however, have found in it the additional help they needed to attain certain objectives.

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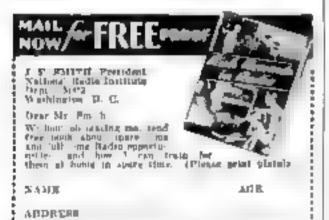
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J. E. SMITH, Pres. National Radio Institute Dept. SMP3 Washington, D. C.



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Secrets of Success

that an opening was available with the - tanif bureau if I wished to move in. An increase went along with the change, so the following Monday I was under the direction of a new employer,

A few months of interesting work passed by with the ----. Then a telephone call invited me for an interview with the chief clerk of the auditing department of the ----- Radroad. The interview terminated in about five minutes when the question of actual experience seemed to stop my prospective employer I put on my best smile, stuck out my hand and said, "Thanks just the same I stay where I am and keep plugging along with my --- course, although I know I could serve you with the knowledge of your problems I now possess."

My interviewer awang me back to a seat with the suggestion that I tell him more about my work. When I finished telling about the home study course, he spoke the words I longed to hear: "Any fellow who will hold down a day job and spend his nights finding out more about his job is entitled to a thorough investigation. What a the name of the man who directs your work at the school?

Two days later another telephone call invited me back for my second interview Half an hour later I left the building an employe of the ----- System. I made good on the job with the ------ System. In three months my pay envelope showed a thirty percent increase over the first month. When some time later I decided to leave the ----System for another type of work, my chief paid me the highest complement I have ever received in my lafe.

Home study courses have proven to me their benefits in the fields of traffic management, education and the ministry. More than that; they tell plainly, and in a short time, whether one has what it takes to make a success in any line of work.-R E C McD , Mossillon, Ohio.

OLD BOX CAMERA SERVES AS MICROSCOPE LAMP

From a discarded box camera you can easily make a microscope lamp that will gave light of three different colors. Re move the front of the camera and take out the small hall that holds the dia phragm lever. You will find three boles in this lever. Use a 5-16-in, drill to make them all the same size. Cement colored cellulose wrapping material over two of the holes and leave the third uncovered. The color changes are made simply by sliding this lever up or down.

I use a 30-watt builb and lead the wires brough the small opening in the back of the camera intended for watching the exposure numbers. If a larger bulb is destred, it would be better to cut a hole in the back for the socket.

When the lamp is in use, the stop for time exposures is pulled up into position to give a continuous beam of light. This lamp is especially efficient in photomicrography because the light can be turned off 'estantly by closing the shutter.-ROBERT BARTLETT,

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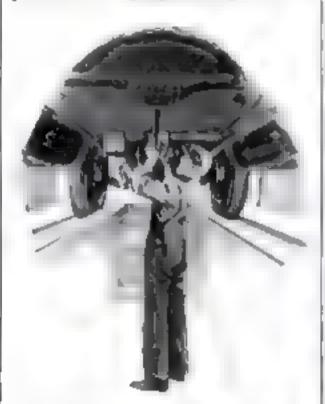
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AUTOMOBILE SERVICING PIT FOR HOME GARAGE

TRE amateur mechanic who wants to service his own car will find the time and money spent in building a home servicing pit a worth while investment. Too frequently the individual car owner neglects the necessary tasks of greasing and changing crank case oil simply because he does not relish the idea of crawling around on the oily floor of his garage. A pit similar to that shown removes this objectionable feature; furthermore, it will increase the sale value of the property

Logically, the time to construct such a pit is when the garage is being built, but



Car berviolng it an ensur task when you can work standing up in a roomy repair pit.

if the floor is already in place, the concrete can be cut to make room for the pit, the steps that lead down to it, and the runway slots on each side

The amount of work required in huilding the pit will vary with the type of soil in your locality. If the soil is firm, the sides of the excavation will serve as an outer form for the concrete. In loose soil however both mner and outer forms will be necessary. Forms for this type of work are built in exactly the same way as foundation forms. However, the innerforms do not extend down as far as the outer once; this is to allow for the base slab, which is poured first. Forms for the walls and steps should be made of fairly smooth 1-in, stock and should be well braced. Old crank case oil, smeared on the inner faces of the forms, wall make the removal of the boards much easier when the work is completed.

In order to provide the proper drainage and a firm footing for the base slab, a 6-in. fill of gravel or cinders should be placed in the bottom of the excavation.

A trial batch of concrete should be made. using 6 gal. of water for each sack of cement, together with 2 cu. ft. of sand and S cu, ft, of pebbles (or crushed stone). These specifications apply only if the sand and pebbles are dry. If the aggregates are moist, use only 5 gal, of water in the mix, Once the right consistency is obtained, the same proportions should be used for

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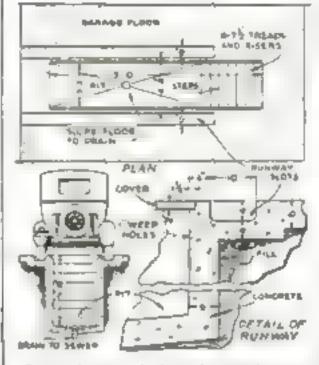
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the remaining batches that are required.

The concrete for the base slab, which ts poured first, is placed directly on top of the gravel or conder fall. This mix should be thoroughly spaded to remove any air bubbles. The floor should be sloped to the central drain with a strike board. After the mass has stuffened somewhat, it should be troweled to insure a smooth surface Troweling also compacts the surface of the concrete and makes it relatively impervious to dirt and oil.

In laying the concrete for the walls and steps, it is best to build them up in even layers. Place un 8-m. layer of concrete all around the walls and in the form for the bottom step and spade it thoroughly Repeating this process, fill the forms up to the top level. The steps should be struck



Plen and sectional views showing the conarruetlen of pit. Note thoulders for cavet.

off with a strike board and then truweled While not wholly essential, a cover for

the pit may prove destrable. If this is the case, a shoulder for the planking should be made by naming two 156 by 2 m. strips of wood level with the inside top surfaces of the two inner side forms

Weep boles, to allow dramage from the runway slots, can be made by custing short sections of 1-in, pipe in the top layer of the concrete. If the pipes are greated they can be removed when the concrete has set

Placing concrete on the floor or patching the break between the old floor and the pit is all that remains to be done. Troweling the floor will provide a smooth surface. E. E. DUFFY

SPECIAL EYEBOLTS—AND A TIP ON SHOPPING

WHEN you are held up in your work for lack of special hardware or other materials that cannot easily be obtained, it pays to look around for substitutes. For example, I needed two small eyebolts about 11/2 in. long, and the usual round of the hardware stores netted nothing-not even something "just as good!" Then I discovered quite by accident a drawer handle with two such bolts attached, all for a mckel.-M. E. BLAKE



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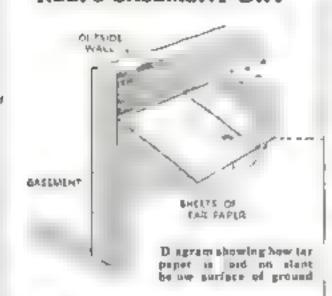


The dys powder is missed with equal parts of hot water god g yeering, and then fittered

By bissony we any shade of ordinary household or cottong dye in a matture of half glycerine and half hot water, a satisfactory ink for stamping pade can be made. The mixing is best done in a lin can, which may afterwards be discarded, because the dye causes a stain that is difficult to remove.

For about half a cup of the mixture of water and glycerine, use about as much dyo as will the heaping on a knofe blade. Sur with a stick and let it remain until cool. The whole can now be poured into a funnel containing a loose pledget of absorbent cotton, which wall act as a filter and remove all undesolved parbeles .- R. W.

UNDERGROUND TAR PAPER KEEPS BASEMENT DRY



MANY hearments become damp or even wet during heavy rainstorms because water seem through the walls, This trouble can be cured in many cases by the method shown. The earth is scaiped off, beganning a few inches below the surface of the ground at the basement wall and signting down to a depth of 18 in, at a distance of 4 ft, from the wall. A good grade of tarred roofing paper is then spread over this slanting surface, and the earth tamped back in place. This causes the water that would otherwise run down the wall to be drained away from the building where it cannot seep through the wall

It will be found that the grass will grow as well as ever above the layer of tarred roofing paper - Lealtr to Routen

BRONZING WITH VARNISH

Bronze powders have a tendency to turn green when used with ordinary varnub because the latter may contain a small quantity of acid. To remove the acid, add an nunce of ten percent caustic soda solution, in water, to each quart of yarnish. Shake it well three or four times. When the mixture is allowed to settle, the varuesh will separate from the water solution and may be poured off for me.





Think of the hoge army of Electrical workers regularly employed in various industries. Investigate just starting to a modest awary to highly-puld Engibeers and superiocentries a literarchy offers bunderful engly years opportunities even when other hand are should be supportunities are when other hand are should encode it between the public demands night and they at the threw of a switch.

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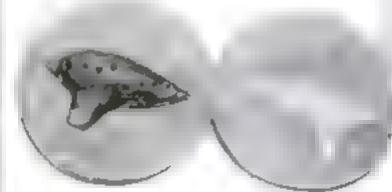
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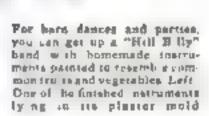
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HOW TO MAKE A

Potato and Banana Band





Novel musical instruments like ocarinas formed from ordinary clay in shape of various fruits and vegetables

By R. H. JENKINS

Professor of Jacobson Remotion Humbridt State Ton Spir College, Mrs. Spir. Coll.

USEC has been played on many instruments but one of the samplest and most novel types can be obtuned indirectly from the vegetable garden

In any music store may be purchased a little instrument known to an ocarina. It is really a whistle made of clay, and, because of its shape, is sometimes known to a sweet potato " Though not extremely melodicus, it is castly played and affords a great deal of entertainment

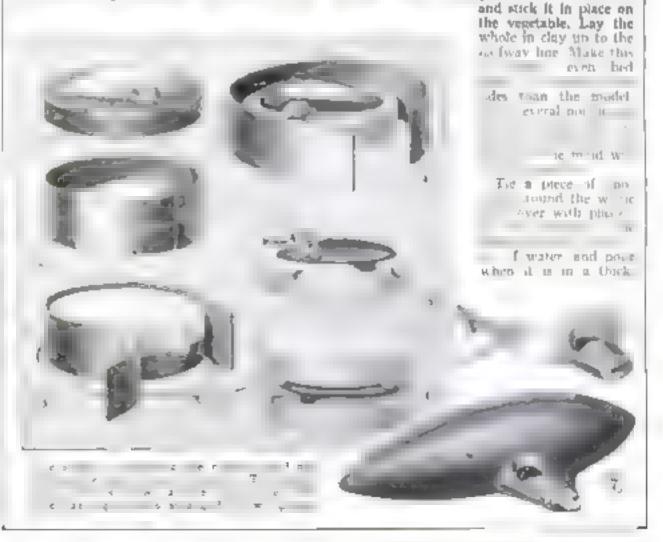
The writer became interested in comparing the shape of the ocarina with vegetables other than the sweet potato, and found that an instrument of similar quality could be made at home from any venetable or fruit of a like

form. Currots, turnips, Irish potatoes, beets, parsespa, and bunarias were tried with equal success. Only two requirements seemed necessary. The air chamber had to be irregular, and the air must be blown in from the side enstead of the end

The construction is so simple that the work is within the range of anyone who wishes to spend a few hours in making these novel instruments.

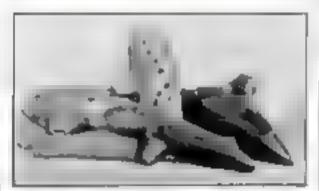
Buy, or horsely from a friend an ocaring to be used as a glode. Purchase or eig from a bank 3 or 4 lb. of clay and buy about 6 o of plaster of Paris or, still better, casting plas-ter, which is ground finer and sets more quickly

t moose for the first inscrument a vegetable of similar form to the ocazina Draw a he around this vegetable the long way, in such a manner as to divide it into two equal parts. Model a solid mouthpiece like the ocarina s



creamy state. As soon as the plaster is hard, remove the known wall, tear away the clay, and cout the face of the fresh plaster with vaseling to keep the two halves from sticking. The the lineleum around once more and, with the vegetable still in place, pour in fresh plaster to form the second half of the mold.

With a case knife pry the two falves apart and take out the model. Rub into each had of the mold a than, even layer of day, except at the mouthpiece, which should be modeled soud. Dampen the edges of the day and press the two halves together. Whittle a thin strip of wood the exact size of the mouth opening and set it in place to form the opening through which the musician blows. Cut the other opening shown, and model a thin sharp edge for the air to strike against. Have this sharp edge



Col retion of finished Instruments. These may be painted as realistically as desired

in direct line with the edge of the stick. In other words, follow the ocuring mouthpiece as nearly as possible

When the mode, ug is well done, carefully remove the stick and test the work by blowing upon it. A low, deep whose should result from this effort. Take a nail and pierce the two hules on the open mouthpiers side, and then the cight holes on the opposite side. Make all holes small at first, then tune the hitle horn by increasing the size of the holes. The larger the hole, the higher the pitch.

If trouble is experienced, examine the mouthpiece. The little strip of wood may be slipped in again and the opening lined up with the sharp edge. Remember, too, that this mouthpiece strip must be this so as not to let in too much air. The edge at the end of the strip must drop off at a right angle and the edge be sharp for the air to sinke against

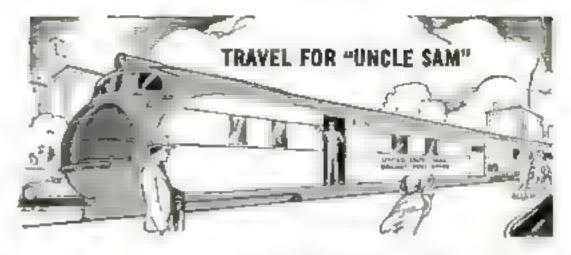
When the modeling is finished, lay the piece away until perfectly dry, and then prepare to fire. To do this, bury the horn in a can of dry sand or dirt, and put the can in the fire chamber of a stove or fireplace. Keep a good fire going for several hours; then let the clay tool gradually as the fire goes out. When perfectly cold, the horn will be found well baked and ready for use. It may be painted any desired color.

The experiment will insure a great deal of fun, and is well worth trying. Several instruments may be tuned together so that a group can play at the same time.

USING SOLDER ON CAST IRON

Tirres are various special ways to solder cast from but I merely use a solution made from about a quarter of a giass of muriance acid, sufficient since to "full" the soid, and several pieces of copper wire. The copper a dropped in while the acid and since are still in action. Try this on any piece of cast from that has been filed bright. I have often used it for soldering the water jackets of automobiles that have been cracked from freezing or overheating. In such cases I chip out the crack with a diamond-point chisel and file the surface clean, then apply the solution, and solder in the ordinary way.—R. C. Patronano.

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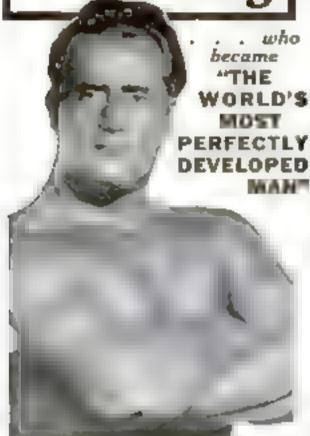
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The 97-lb. | Machine for Setting Band Saws

ETTING hand saws by hand is a difficult and tiresome task but the homemade machine illustrated enables any band saw from 's to 1, in wide to be set accurately quickly and easily. One turn of the camat a time assem every other tooth over the anvil and a hight tap on the navil hammer with a small hammer then sets the teeth After had of the teeth have been set the saw is turned over and the other half are set the opposite way merely by engaging the linger of the cam I mower on the oppos-

The construction is clearly shown in the drawings below I se hardwood for the

base and other wooden parts. A piece 11/2 by 114 by 915 in. is screwed under the base as indicated. To the upper side groe and sail a piece 34 by 254 by 954 in., the piece being cut out to fit the anvil. The square nuts for the machine acrews that hold the sheet-iron adjusting plates and the saw tensioner in place are fitted into the wood as indicated and held with the bedgrate

The apvil and hammet are made from sicel and hardened after being filed to shape and drilled. The mounting for the hammer is made from ' in angle iron. The saw guide is formed from 1 57 in house and screwed in

place against the anvi-



Serving a 4 in band new with the dretce. The gave is tapped. then the handle to turned to move the blade a ong two tooth more

The cam is cut from a piece of wood 1/2 in. thick, and the edge is bound with a piece of bran 1/32 by 35 by 8 m,, the ends being bent and soldered into a slot, which is cut in the lowest point of the cam. The cam rise is \$4 in

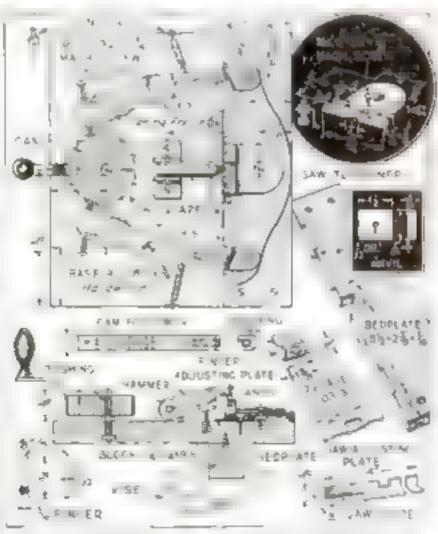
Make the cam followers from 1/2 by 3 by 51/2 la. wood. Drill holes for the bushings, which must be a free fit on the machine strews, Reenforce the care end with bruin, minsolder the machine screw nut to it as shown On the finger end, insert a piece of square bram tubing measuring 1/4 in, square on the imade. File the finger from a piece of steel to the dimensions given. This is then hardened The small springs that keep the finger in con-

fact with the saw are taken from tire vaives

After the machine is assembled and the law put in place, the adjustments necessary win tooth dom not align directly under the hammer, a stight lura of the screw on the cam follower will bring the tooth in line for setting. After this has been done, the adjusting plate must be set so the finger win take every second tooth with one turn of the

The tension on the saw is controlled by raising or lowering the tensioner har If 1/2 in saws are to be set, an extra plate is mared ander the saw tensioner This is cut from 3 stin. Too in the same yeneral shape as the saw tensioner, but is flat except for a 1/32-in. hp. which is turned down along the front edge.

A little studying of the machine will soon familiarize one with its working, and the setting of band saws will thereafter be easy to do. -EDWIN PUTZKE



How the machine is made. The note on the saw tensioner are soldered to place and the ower ends of the two machine screws are filed to 5 32 in. in diameter for civeting to the tensioner bar

LIGHTHOUSE KEEPERS OF THE SKY

(Continued from page 15)

broke, A repair job at a machine thop would have taken the station off the air for several hours, B. H. Barker, the man at the radio. did some quick thinking. Fishing rubber bands from his desk, he wound them around the key so that they took the place of the useless spring. With this makeshift repair, the apgaratus kept going for several days notif a new part arrived from the manufacturer

In addition to the equipment at the intermediate fields, the airways have automatic revolving beacons spaced fifteen miles apart An airwaya mechanician services a 200-mile sector, making regular trips to see that the apparatus is in good order. Each beacon holds two bulbs, the second slipping automatically into place if the first burns out. At some of the most isolated beacons, caretakers live near the towers and devote all their time to tending the one light

LONELIEST of these mountain lighthouses is one on a jutting rock 6,860 feet above sea level at Little Luke Pass, Nev.

During wanter months, the only way to get to and from the station is on snowshoes and the caretaker communicates with the outside world by means of aght signals Using a prearranged code, he flashes messages to the pearest other beacon, eighteen miles away, at Shver Zone, Nev

On all the nirways crossing the western mountains, snowdritts add tremendously to the work of the airways field men. Near Rattlesnake Ridge, Wash., for instance, Wil-ham Graham and his helper had to burrow through a thirty-foot doft to get into the power thed of an isolated beacon

Then, when they started to leave, they found the tunnel had caved in, Jamesing shut the door of the shed. By removing the mah from the window, they were able to dig their way to open air. From outside the building, however, they could not reputes the sash. So they had to dig out the first tunnel again, replace the window from inside the shed, and leave by the door

Became of the heavy snowfalls in the Rattlesnake Rulge remon, the metal rabinets hotning the switches and astronomical clocks are being placed thirty feet up on the towers instead of in their usual positions at the base This saves hours of back-breaking digging during winter months.

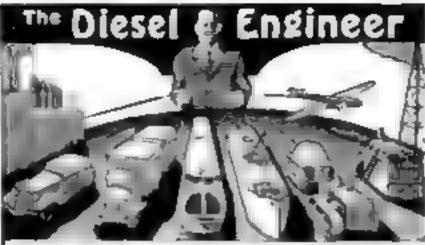
Electrical storms, with their lightning finaliss, always form a spectacular bazard for the alaways men. Three or four years ago Charles trish had a hair-ranting experience with a thunderbolt at the Amarillo station.

IT WAS early in Judy. About midnight, the storm broke over the field, Irish was just reaching for the microphone to broadcast the weather when the whole room seemed fixed with blue, running flames.

A friend, who was driving down the road at the time, told him later he saw a ball of fire run work the 125-foot antenna wires and down the lead wire into the radio shed. The bolt circled the room from one electrical apparatus to another, leaving Irah in the center unharmed

In complete darkness, with the air filled with acrid fames, he groped for a flash light and found that every piece of apparatus in the bruding was out of order Driving four mars through the storm, he reached a telephone and sent out an 5.0.5, for a repair man with spare parts.

In the work of an airways keeper, there is Little fanfare or ballyhoo. The risks he meets are part of his job. The emergencies he overcomes are taken for granted. But, quietly, efficiently, he is playing his part in bringing greater safely to the sky



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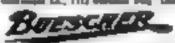
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RILLIANT modern-looking wall pictures or decorations can be made from common to foil and too papers. A vaearly of such papers can be obtained from package wrappings in silver, gold, and other colors. They provide the mainstay of the work Other items required are a sheet of glass, enamel and lacquer, and a design to follow

A parrot design was chosen for the picture illustrated. A sheet of glass of the size of the finished picture is placed over the design, which is traced with a fine brush and black rnamel. Only the outline and important parts are marked. When this is finalised, use some transparent lacquer in different colors to fill in the design, following the colors of the origmal as closely as possible. It is wise at this time to see that one particular color predommates and that it matches the color scheme of the room in which the picture is to be hung Much contrast is permasable, however, as the rologing must be brilliant to be effective. If



B noting edges of a parrot design, which is painted on glass and backed with motal Joil

genuine transparent lacquer is not available. use clear larguer to which dyes have been added.

After coloring, the next operation is to fill to the background (in this case, around the parrot and foliage) with black enomel, applied in a thick coat. Then crinkle up a sheet of tinfoil, open it again, and apply it with transparent cement wherever desired to form a background that can be seen through the sacquer colors when the picture is viewed from the right side—that is, from the unpainted side of the glass. This increases the brilliance of the colors. Obtain a sheet of gold-foil paper, such as jewelets use for weapping their wares, and cement it down over the entire back of the

design. This will give a background for any parts not covered with tin foil.



Page Chilips

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PUPULAR SCIENCE MONTHLY

252 Fourth Avenue

New York

BARNUM'S MUSEUM

(Continued from page 17)

open the door and find themselves on the street, unable to enter the building again without paying another admission fee

Around the whole exhibit, which will provide a Christmas attraction for a chain of eastern department stores in New York, Philadelphra and Pittsburgh, Pa., there will be immense side-show banners, painted in brilhant red, blue and orange. In the unrestrained language of Barnum, they will set forth the amazing wonders to be seen within

One hundred and ten feet long and eighty feet wide, the exhibit will contain reproductions of most of the famous attractions which once appeared in Barnam's American Museum. This five-story structure on lower Broadway, near City Hall Park in New York City, contained at one time nearly 600,000 oddities, curtosities and frenks of nature

It was the American Museum that gave Barnum his start as a showman. At its beight, there were no large free museums in New York and after 1841, when Barnum took it over, it was famous for more than a quarter of a tentury as an amusement center of the city. Twice it burned down, once destroy ing virtually the whole \$400,000 collection if contained. Each time, it was rebuilt

Before starting work on their exhibit, the experts of Messentre and Dazson spent several months in research. They examined old books, newspapers and magazines dealing with Barnum and his times in order to make their mechanised spar abschools a true pacture of the are not instead of worders

For many years, this firm has been poted for its huge and spectacular displays of mechanized monsters. Applying the latest aids of within its engineers have created moving, h roke figures that range from representations of comit-page heroes to scientifically accurate reproductions of prehistoric monsters. In prepuring many of their exhibits, the men have consborated with scientists from the American Maseum of Natural History and other institute is to give wientific value at well as ammement appeal to their displays

EXPERIMENT SHOWS HOW FORESTS MAY BE SAVED

Will scientific himbering methods have our remaining forests? Conservation advocates, who com hualty fee to tell us we can point at last to a convincing example, the 9-31 aute Watney Preserve in the Adirondark Mounta to I New York In 1898, lumbermen followed a plan laid down by the United States Division of Forestry for logging the area, and cut enough pine and spruce to bring the owner and contractor foctunes. Spared from the az, however, were the firs, hemlocks, hardwoods, and all spruce nine inches or less in diameter. Foresters predicted at that time that a second crop as large as the first could be cut by 1915. As this is written, according to the New York State College of Forestry the second cut is well under way and is more than fulfithing the prediction, proving that a forest may be sumbered indefinitely, without damage, if gound principles are followed

HORSES AND MULES ARE RETURNING TO FAVOR

Last year, there were 10,000,000 fewer horses and muses in the United States than here were in 1920. Additional statistics of the Horse and Mule Association, however indicate the animals are rapidly returning to favor, largely because they can be fed with outs and other products of the soil which the farmer can raise himself. Interest in buntung, polo, and riding for pleasure also is said to be stimulating the return of the horse

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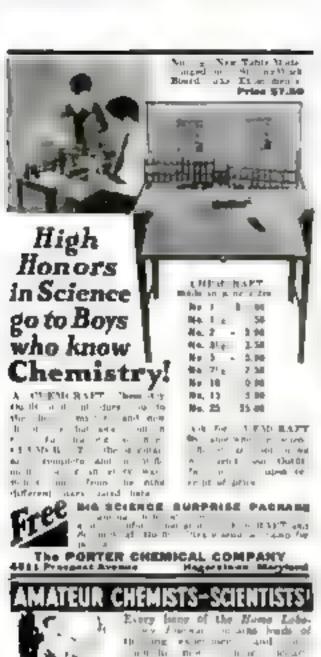
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TANKS—PEACEMAKERS OR WAR BRUTES?

el antifined from page 28,

go off roads and cannot cross battlefields. The Infantry now have a "medium tank" designed on what are generally casted the Christie principles, weighing twelve tons It is driven by a Curtise airplane meine and carries a crew of four men and, perhaps, even a one pounder cannon in addition to machine gures. There are no American land battleships with heavy cannon

But Mars has contrived many improvements. For armored cars he has evolved an armored hull that is also a chassis, to which are attached axles and springs carrying the wheels For tanks, he has reduced driving fafigue by a vacuum booster to operate steering clutches and brakes and four gear speeds.

He has made life bearable for the tank crews. Power-operated blowers will clear the air of engine heat fumes, and gai. A new type of insulation will stop but lead from butlets from coming through nurrow peep slots to blind them. They can hide by amit ng smoke screens. In battle, the tank crews can talk to one another by radio telephone, through specal padded belimets.

BUT some one asks, "what will the tank

That quest on is not so redictions as it may sound. In fact, it is keeping some tank experts awake at might, and they haven't found the answer That is why General MacArthur says.

"The idea that some particular machine will completely dominate buttlefields of the future, is a figment of the Imagination. Such contentions ignore not only mechanical limitations, but also the ingenuity of man in developing neutralizing agencies for the engines of destruction be bimself has created."

For instance, winged bullets. There is a new bullet, called the Gerlich Hasper-Ultra, invented by a German. Circling it are two wings or flanges, made by cutting two rings around

the jacket and turning them up at an angle of forty-five degrees. These wings or flanges fit into the grouves of the rifle barrel, which is made in three sections—a wide, cylindrical have an intermediate cone and a narrow musric tabe. As the winged bunct shoots through the barrel, no gas escapes and as the driving force of the charge is used. At the same time the bunet's passage through this tapering space gradually folds the wings back into place, flush with the surface of the Jacket, so that wind resistance will not slow it in flight.

WHEN the bullet emerges from the muzzle, it is traveling about twice as fast as an ordinary bullet from an ordinary gun, and its striking power is increased promet onates

Will the doughboy, with his little hullet, slay the giant tank? Suppose that, in these fierce, brief two minutes of crucial combut when the tanks are rushing upon the trenches, the infantry have machine guns, rides, even putols, shooting these miraculous new wanged bullets. Suppose the busiets not only pierce the tank's armor, but explods inaide the tank, among the crew

Put thicker semor on the tank? But that means a beavier tank, after seventeen years of effort to make it lighter by using electric-arc welding, lighter steel, and aluminum. And to move that beavier tank takes a bigger motor which means, probably, a slower tank and a sarger one

Once let that start, and the new tank of 1935 has backslid to the weaknesses of the old World War tank

There is the virnous circle. To break it is the task of science and invention. Which who win, the doughboy with his winged builet, or the tank with its new strength and speed? That, today, is the riddle of the tank, that every nation is trying to solve

STUNTS WITH THE CHEMICAL TRIPLETS

ct outmied from page (3)

cut off, mounted in an inverted position, and a spoon made by fitting a stiff wire handle to a metal screw-on top of a can. A flow of Communiting gas is admitted to the bottle through a cork in the neck. Place the strontrum or buriam chlorate in the improvised spoon and heat it until it commences to liberate oxygen gas. Then lower it tenmediately into the chamber fixed with illuminating gas, The chemical burns with a dazzling flame, tented by the characteristic color of the chemurai used.

Because of the vivid color these themicals impart to flames, they find an important use in fireworks. Strontium compounds, for example, are responsible for the vivid color of the "red fire" med in Fourth of July and political celebrations, and of red flares used as danger signals. You can easily make one of these red-fire preparations in the home laborationy by mixing intimately sixts set parts of strontium autrate, twenty-five parts of putassum chlorate, and nine parts of powdered orange shettac. The latter should be hought an the powdered form, since polverizing it is tather difficult. Another simple red-fire forreula is . strontium mirate, eight parts; sugar, four parts; potasseum chlorate, one part When either of these mixtures is ignited, if will burn with a duzzling romson dame A green are may be prepared from hanum chi-rate or cutrate six parts of harium oiltate, three parts of polassium nitrate, and two parts of sulphur will give a satisfactory

preparation. The proportions for all of these mixtures have been given in parts by weight, and any convenient unit of weight, such as an ounce, or a quarter-ounce, may be substituted for "part" in the formulas above. For best results, the ingredients should be weighed out carefully in the exact proportions given.

FOOD MIXTURE CONTAINS ALL MATERIALS NEEDED

SEERING an idea, food for invalids and convalescents, research chemists of a Bridgeport, Conn., inboratory report that a world-wide search for suitable ingredients has finally yielded a satisfactory compound. The mixture, named "manatone," consists of banana pulp, ground coconut, maked milk, skammed milk, wher, and dextrose, with the addition of cocoa. for flavoring. It is reported to satisfy the requirements imposed upon the experimenters which were that the food should be pleasant to the taste; that it should contain all nutn ent materials, vitamens, and mineral talts needed by the body, as well as enzymes that would make it partially sel digesting that its fats and proteins should be in easily dizest bieform, and that it should consist wholly of natural autotances, excluding synthetic ingredients whose properties might not be fully known. Thousands of combinations of ingredients were tested before the mixture was financy selected.

AN EXPERT TELLS YOU HOW TO PRUNE SHRUBS

Continued from page 48)

tying the main stem to a wooden stake two inches square, or to an iron pipe Since the tying serves as a goade and not as a support, strings or tapes should be tied tightly around the stake and loosely around the stem of the tree. They are best placed one foot apart and cofficiently loose to permit a movement by the tree of three inches in each direction Loose guides prevent binding of the trunk and also permit the plant to develop strength. Sught variations or waveness in the stem will be outgrown as the trunk develops.

NEXT, establish the height of head, or the distance from the lower limbs to the ground. No itmbs should be allowed below a height of six feet. When a small tree is planted, allow nothing but the tip or terminal bud to develop. Pinch off any side or lateral branches, which usually come out at the and or base of a leaf, as soon as they are formed. but do not remove the leaves. Continue pinching off lateral growth uptil the top his reached a height of six feet, and from then on the tree will shape itself

Some varieties are easily blown salast by the prevauing wind. As a precaution against this is planting, the trunk may be trained into the wind at an angle of about afteen degrees from the perpendicular. Do not tie back or straighten a wind-shoted tree artificially, for the support may break later and the whole tree in down as a result of being weakened by outside support. By trimming wind-blown trees on the lower part of the heavy side, you will force new growth on the light side. In this way the tree may be straightened up without weakening its general accurate

As shade trees become older, weight of wood and leaves will pull the lower branches down, until they interfere with the free use of the lawn. Do not prop these branches up and try to save them. Saw them off wherever they become a nuisance, and new growth will he formed higher in the tree

Uniske must arnamental trees, Arizona and Monterey cypeens require no pruning, but the tall, slender Itanan cypress and its hybrid rel atives which resemble it closely, will need some occasional attention. When these cyprose trees regin to send out side branches that show a tendency to fall away from the main column of the plant, do not, under any circumstances, tie them back in place. Tying merely protongs the agony of a complete failare of the desired type. Using long handled ahears, cut off the ends immediately inside the mean forage. This will cause lateral growth to shoot out below the cut and the hole made by the removal of the branch will soon be fated

A light tramming of the outside tips, particularly where the tree is used as a formal specimen, will smooth up its appearance.

FLOWERING trees, such as flowering peaches, provide unusual beauty in the spring Heavy cutting is required to produce more and finer blooms on these. In fact, you can double the life of flowering trees by adequate pruning, starting as soon as the plant has put out its first crop of blooms and contipuing every year thereafter

Cut out severely all of the past season's growth as soon as the pelah have failen, leaving short stubs four to six inches long. New dowering wood will soon spring from these stubs and will have ample time in which to develop for next season's flowers. The peach, being a weak wood, tends to develop internal rot when growing slowly, and this system of pruning will keep the tree in vigorous, continuous growth. Although the sup will be active at pruning time, and some gum may caude on the bark, there is little danger of sour-sup harming the tree.

"Then shall not be afraid for the tereor by usght, one for the arrow that fleth by day was for the posteconceshed

tracketh in darkness, nor for the de-struction that a accet at according. DESTARS and home assume who is drive of anest. It may be have remarks who is the problem to the first with the error of high to destable to be problem assume the problem to the relation of relations of be at the first of the factor planet equality and proper to a start of the factor planet equality.

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NO PLACE LIKE HOME-TO GET HURT

(Continued from page 35,

front of a bank window depositing your weekly pay check? The answer is, you cannot be sure, no matter where you may be, that chance will not reach out to inflict injury in greater or lesser degree.

One mishap led to the discovery of an earlier one. Mrs. Josephine Illman, of Mrs. waskee, Wisc., accustomed to sewing for many years, plurged a needle into her thumb. She was rished to a hospital for X-ray photographs. The pictures not only revealed that needle, but also showed embedded in her hand a smaller one which she remembered "Josang" long ago.

Several workers in a New York dresmaking establishment suddenly slumped in their sexts. Investigation revealed that fumes containing a poisonous gas were blowing in through open windows from a freshly painted roof nest door. They were asphysiated by an out-of-doors painting job, an almost unbeard of accident

HUNDREDS became pasic-stricken in a theater at Hogota, Colombia, when some one shouted, "Farel" Several fell from the balcony on those below; one was killed, a score were injured. Some practical joker had shouted the alarm. There was no fire.

Frank Coltem, of San Jose, Calif., went fishing in a mild surf near San Francisco a Golden Gate. While standing is water hip-deep, an octopus seized him, wrapping long tentacles around both legs and one arm. His companion, Harry Simmons, went to his aid armed with a butcher krufe. As quickly as he severed one tentacle, another seized his friend. Only when Simmons plunged the krufe between the octopus's eyes did the creature bone its hold. Rings left by the powerful suction cups were found on several parts of Coltrin's body

Although less danger attended the incident directors, clerks, and customers in an eastern bank suffered considerable discomfort the other day when the building became flooded with tear gas, intended only for bandits. An electrical short circuit set off the gas aprinking system, and the gas drove scores from the building. A few minutes later, business was resumed as usual

Birds and animals play leading roles to many accidents, some as the moving cause, others as innocent victims. A wild pheasant weighing only six pounds knocked out Frank Pearl, engineer of a crock train roaring at seventy miles an hour through New Jersey the other day. The bird flew head-on through the narrow glass windshield which protected the engineer against wind and rinders, striking him in the furthead, Frank sluzaped unconscious in his seat, but safety devices stopped the team. The train proceeded after the engineer was revived.

HARRY BALL had a similar expenence on a country road near Loverna, Sas-katchewan, when a rabbit leaped through the windshield of his coupe and disappeared through the rear window. Ball was severely lacerated by flying glass, and the rabbit paid the supreme penalty for its carelessness. A Hingham, blass, fazzaly was less fortunate One of a flock of greese walking along the road flew into the windshield and dropped dead in the car. Five of the passengers were painfully lacerated by flying glass.

When bulls and box cars that the results usually are somewhat more sensational. The recineer of a freight train rumbling through Georgia saw a large bull standing unconternedly alongside the train. When the engine approached within a few feet of the animal, it stepped onto the ties. Result locomotive and more cars plunged into a modely ditch, en-

gineer and fareman killed, nine but cars de-

Where the next accident, of water, fire, force, or fumes, will occur more tun say Despite many efforts at safety education, the death toll increased nearly one tenth last year, when 101,000 people succumbed from mishaps of all kinds in the United States.

NO MATTER where you may seek thrills—in the air, on land, or at sea—home continues to be the most dangerous place in the world. Of the 9,821,000 disabling injuries from all causes last year, more than half happened at home

Too, there accidents increase every year Here are a few startling facts. Rhode Island is the only state that did not suffer an increase in total accidents last year. Wage loss, medical expense, and insurance cost the injured \$1,400,000,000 and property damage, including buildings raced by fires accidentally started, reached the staggering total of \$3,500,000,000. No disease both as many children as accidents. One person in five may reasonably expect to be injured during the next twenty-five years.

Finally, more than twice as easily people will meet accidental death at home this year in will succumb from accidenta of all kinds while at work Of these, fails and burns are the most important causes, Nearly half of the falls occur in bedrooms, more than half of the huros in hitchens. Recent studies by the Kansas Department of Health show that more people die from slipping on floors, rugs, and stales, falling while getting in or out of bed, or while setting down in or getting up from a chary than from all other home causes.

For safety, you must take to the bath room, which the Kamas authorities found to be the safest room in the house, with only one fatal injury in twenty there, or to the air Statistics recommend simplanes rather than both rooms.

BIRD SONGS RECORDED DESPITE DIFFICULTIES

Brims proved to be as temperamental as movie stars, when naturalists of Cornell University and the American Museum of Natural History recently toured the country to record hird sough upon sound film. A Carollea wren, instead of performing vocally for the scientists, took refuge in the sound truck and attempted to build a nest. A real mocking birdheard the recurded voice of another, while one of the Florida films was being tested, and dashed at the window of the room to drive the supposed rival away. When the comeratren lowered a microphone over a Colorado chill, to a golden eagle's nest on a ledge 700 feet below the eagle tried to swallow it Despite such difficulties, the expedition obtained ten miles of sound film bearing bird calls they sought, including those of some of America's rarest species

BRAIN WAVES MEASURE DEPTH OF SLUMBER

"Linury" and "deep" sleep—hitherto vague terms—may acquire definite meaning from recent tests at Turado Park, N. Y. Recording the minute electrical currents in the brains of sleeping persons, experimenters recognized four distinct patterns of brain waves, which they named 'random. Irans, "saw tooth," and 'spindle." These patterns seem to be directly associated with different levels of consciousness. A person who has just fallen asleep, for example, shows the "trains," but as sleep becomes more profound the wave type changes to a "random" pattern

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HERE'S THE ANSWER

Continued from page 577

it runs along the surface of the water for seventy to eighty yards before it can rise in the

A Nonwetting Fluid

Q .- wrry is it that mercury, a liquid, does not wet paper when allowed to remain on it? -D. T. H., Wilmington, Det

A .- THE relative density, or specific gravity of the mercury is so much greater than that of the paper that the latter does not absorb the

Trunks To Spare

J. B. D., potse, manu. A bunyan tree, in the Calcutta botanical gardens, has a main trunk thirteen feet in diameter '40 trunks as large as oak trees, and over 1,000 smaller trunks The banyan tree, native to India, sends down preat numbers of shoots from its branches which take root and ultimately become additional trunks.

Gets Its Own Grub

S. K. B., streeverser, i.e. Spanish mon is not parasitic, as commonly believed. It is an epiphyle, that a, a plant which grows on the surface of other plants and depends on them for support but not for food. And it is technically not a moss but a member of the paneapple family. Commercially, it is used for stuffing mattersers, borse collars, noto upholstery, and for packing material

There's No Sterile Soil

C G A., roke wonser, TRR. Every soil in fertile, but all land is not fertile because all land does not have soil. Soil is formed by a progressive process. Rock must first be broken down by the weather. This weathered rock is then converted into soil by hy ne organisms The types of microorganisms creating a soil give it mousidual charac erotics. The soil bacteria and plants actually develop together and each has an influence upon the other Soils, of course, can be given desired characteristics ar-Lingally,

Preventing Carbon Smudge

Q.- is there a method by which bound rarbon copies can be prevented from smudging !- A. P. S. St. Paul. Minn.

A - a stocastio method to channate the tendency of bound carbon copies to smudge consists of incluing the counted wax of the carbon print into the fibers of the paper This may be accomplished by passing a tall Bunsen flame rapidly over the surface of the sheet The paper should be lying an a smooth, goodconducting surface when the flame is applied. If the sheets warp sixhtly, they may be flattened in a press.

'Sees' With Its Eyes Shut

Q.-po says have supersensitive eyes that enable them to dust about in the dark?-B M., Mohile, Ala

A --- it is the wines and ears of a but which enable it to fly in the dark through thick for esta without striking a tree trunk or branches The wines contain a fine network of nerves by which the animals seem to be able to detect in advance the slightest vibrations caused by air currents striking solid objects. Their sense of hearing is also acute. Experimenters have sealed the eyes of bats with gum and reicased here in a large room where many ropes were suspended from the ceiling. The bats darted about with their usual speed without striking the ropes. The but, incidentally, is the only mammal capable of true flight.



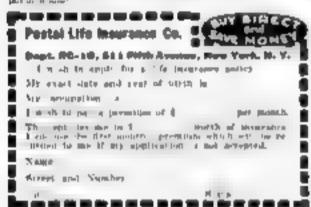
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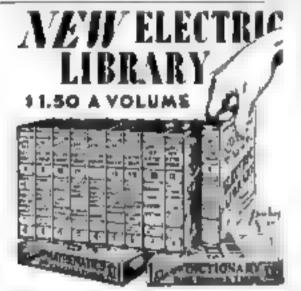
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GUS SAYS: QUIT YOUR SKIDDING!

(Continued from page 98)

Gus wiped the grease from his hands. The hub was dismounted, and there was nothing more to be done until Jue returned with the

Learning what to do about a skid by actually trying it would be one way. Gus smued, 'but you'd stand a fine chance of wrecking the car and tanding in the hospital. The hing to do, Mrs. Dean, is to learn how to avoid a man'.

"I'd he very grateful if you could teach me that," Mrs. Dean suggested

"Well," Gus began, "the first thing to learn is to keep your brakes in good shape. If the brakes on one side of the car are holding stronger than on the other side, you are likely to skid out of line even on dry pavement when you have to jam on the brakes in an emergency. That would mean an accident if you happened to be driving close to a line of other cars, so that swinging out would mean hooking hub caps or humpers with one of them. Any time you notice that the car seems to have a lendency to swing to one side when you put the brakes on hard, have your brakes examined right newsy.

"I WON'T have to worry about that, Mr. Dean is very fussy about the brakes," Mrs. Dean interrupted.

"I know he is," said Gus. "I only mentioned it so that if he happens to be away on a trip and the brakes don't seem to be working right, you won't let it go till he gets back

Now Los continued, "a skid atways follows when at least two wheels lose their hold on the road surface, or even one wheel if you are going around a sharp corner and the weight is nearly all on the outside wheels Skids mostly are started when the motion of the car is being thoused. Going around a corner is changing the motion of the car So is putting on the brakes or speeding up. And, as putting on the brakes or speeding up. And, as putting on the brakes changes the motion fastest of all, doing this when you're going around a curve, makes it twice as hard for the ties to stick to the road. That a why mist skids come on the turns

But your car can points a stud even when it's moving straight shead at a uniform speed. In that case, the crown of the road may be partly to blame, because when a car is tipped indeways on a surface that is not level, it naturally wants to slide sideways.

"Once," Gus explained, "I was driving down a wide, smooth boulevard that had only a fittle crown to it. It started to street so that it formed a thin sheet of shany, smooth ice. My tar, no enabler how carefully or slowly I drove slid right off the road into the gutter and I couldn't go on till I'd put on the chains. So far as I could see, all the other cars on the road that didn't have chains on were having the same trouble. Of course, if the road had been dead level, I could have gone on, still it would have been mighty dangerous, because, on a surface like that, it would have been impossible to stop in a hurry."

TVE been told you don't ored chains with these new bir tires. Mrs. Dean objected. Don't let anyone fool you that was "growled Gus, as Joe drove up with the new bearing and the gray-haired mechanic set to work to assemble the bub. "When the roads are covered with glare ice, there ma't anything except a pair of steel chains that will make driving even reasonably sale.

"Of course." Gos went on, as he smeared a liberal supply of grease on the new set of rollers, "the broad treads of the new turns hold better in mud or snow than the skinny turns we used to use but rubber won't late into the surface of giare we and that's what you need when its just barely freezing and the are is extra slippery.

"Next to me," said Gus, "come wet leaves as a cause of dangerous shids—mainly because lots of motorists don't realize that the leaves are shippery till it's too late. After ice has been on the ground for quite a while, dust and dirt settle on it and it isn't quite so slippery But the longer wet leaves stay on the ground, the more slimy and slippery they get

"Most people thank that you'll never skid on a concrete road. It's true that dry concrete gives fine traction and even when it's wet the traction is pretty good, but I've seen some bad skids on concrete in places where a lot of sand blows on the road. If you try to go around a corner too fast on a sand-covered concrete road, the tires start to roll sideways on the gruns of sand just like they were so many little ball bearings."

"You'd have to keep a shurp eye on the road, to spot all those different kinds of things before you get to them," Mrs. Dean observed

THAT'S the point, exactly," replied Gus, as he sampled the hub cap in place. Keep your eye on the strings of the toad ahead, and as soon as you spot anyth ag that deasn't look just right—especially if it's at a turn—slow down right away while you still have good surface under you to slow down on Then, by the tune you get to the danger spot you can slide over it at slow speed without using your brakes and there won't be much chance of a skid.

But suppose you do shirt. Mrs. Dean

asked "what do you do then?

"If it's a bock-wheel slud, turn your front wheels so they'll pull the front of the car in the direction the back wheels are sliding so as to prevent the front of the car acting as a pivot for the back to swing around. At the same time, take your foot off the brake, let up the church, and give it just a touch of the accelera-

If it a a front wheel skid, there isn't much you can do except take off the brake, if it a un, and pull your wheels back to straight age n.

and pull your wheels back to straight age n.

And," Gus finished with a grin, "no matter what kind of a skirl it is, say your prayers—and say 'em purck!"

NAVY TELLS OF TIME AIRSHIP STOOD ON END

Ir 21000 on end, statisticians once said of the U.S. Navy dirigible Los Angeles, the 058fact craft would tower above all but New York's ten highest skystrapers. Reviewing the career of this veterals turship, now retired from service, turval authorities recently revealed that once it actually did stand on end

It was a feat, officials declare, that never has been executed by any other alreship and probably never will be. With twenty-five officers and men aboard, one cam afternoon, the Los Angeles rode at her Lakeburst, N. J., mooning mast in a gentle land breeze Without warning, a sea breeze sprang up in exactly the opposite direction. The colder incoming air caught the ship directly under the tail and little it. Before ballast could be shifted or other means taken to trim the traft, it was standing on its nose, with the tail up at an angle between eighty-five and ninety degrees.

Swiveling on its nose syndle, the topsyturyy airship then faced about into the sea breeze and came to rest on an even keel. The men abourd, toused about as they were, had not even a scratch to show for their remarkable experience. The Lor Angeles showed unsuspected strength by this freak demonstration but a second performance was not desired. The incident bastened the discarding of the tall encoring must then used, in favor of low, stub masts which permit the stern of an arrhip to be anchored to a traveling carriage on circular rails.

PJ_Q-TL2-T2YY

TWO-TUBE SET BUILT WITH SPARE PARTS

(Continued from page 55)

any position of the plug is satisfactory.

For long-distance work, it is imperative that a good antenna he used. First of all, the antenna itself should be located as far above the roof top as possible, or stretched out in the clear, well away from buildings and electric lines. The proper setting for the antenna condenser will have to be determined by experi-

To tune the receiver, turn the regeneration control to the right. This turns on the power supply. When the tubes have warmed up, advance the regeneration control until a rushing sound is heard from the loudspeaker. Then turn the tuning condenser slowly until a station is heard. If the regeneration control is advanced too far, a whistle will be heard or the signal will be muffled and indistinct. Turning the control back and changing the dial setting of the tuning condenser will clear the signal. This apparent change in tuning is brought about by the action of the feedback, since it tends to alter the inductance of the circuit, necessitating changes in the capacity.

As with any regenerative receiver, the tuning condenser must be adjusted slowly. Even after a station has been tuned in, it is wise to readjust carefully the dial in an attempt to

find a better setting. The coils, L., L., and L., are standard sixprong, plug-in cods. They may be bought, or wound is accordance with the following speci-

COIL WINDING DATA

Scattons:

Coll Runge Merco	Primary Turns	Tickler Turos	Swembery
17- 41	6	4	9-No. 16 Enam.,
33: 73	12	6	16-No. 16 Enam.
66-150	2.5	11	31-No. 34 Essen-
135-210	No	17	82 No. 14 Engra-

Primaries wound with No. 14 dsc. were. Tickless wound with No. 11 dsc. wire. The primary windings are interwound with the secondaries starting at the ground end and have the same number of turns per fach as the secondaries. All windings are in the same effection.

If carefully built according to the diagram and instructions, the outfit will give surpris-ingly good results for a small AC-DC circuit. The original receiver is the best all-around two-tube set the author has had the pleasure of using and its volume on the loudspeaker surpasses that of many four-tube outfits.

LIST OF PARTS

Ca-Variable condenser, 75 mmf.

C1.-Variable condenser, 140 mmf.

C1-Fixed condenser, .000125 mfd.

Ci.-Fixed condenser, .0001 mld.

Co.-Fixed condenser, 5 mid.

Ca.-Fixed condenser, .02 mfd.

C, and Ca.-Electrolytic condensers, 12 mid., 200 valts,

C.-Electrolytic condenser, 25 mfd., 25 volts.

Cin-Fixed condenser, D2 mld.

Co-Fixed condenser, 1 mfd.

R .. -- Fixed resistor, 1.5 megohnes.

R. Fixed resistor, 250,000 ohms, 1/2 watt,

R.-Fixed resistor, 500,000 ohms, 3/2 watt. R.,-Variable resistor with switch, 20,000

obms.

Ra-Fived resistor, 30,000 ohms, 1 watt.

Re-Line cord and resistor, 315 ohms.

R. Fixed resistor, 1,500 nhms, 1 watt.

R. Fixed resistor, 1,500 ohms, 1/2 watt.

Ch.-Filter choke, 30 henry

R. F. C .- Radio-frequency choke, 10 mh. Miscellaneous-Chassis, cabinet, speaker, two dials, three sockets, antenna-ground binding-post assembly, set of six-prong plug-in coils, wire, solder, lugs, etc.



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PROBABLY the simplest recipe for inven-tive success would be this | First, a practical, useful invention; second, a good, strong Patent; third, a buyer or a market. The inventor needs all three to get anywhere. Lacking any one, he is likely to get nowhere. The recipe is simple. Working it out isn't so simple. That is why inventors and others inventively inclined have found the two books shown here so helpful. We've gone into each part of the recipe carefully. Exactly toket is an invention? We tell you. What is a strong Petent? We tell you. How can I go about hinding a buyer? We tell you.

But there's much more, For example, just how an Application for a Patent is made; how an inventor can safeguard lamself with dated sketches as he goes along; how the pertinent Patent Office records are checked to see what other inventors may have done along the same line; how some successful inventors have secured financial backing; simple ways to contact manufacturers; and many other points.

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WITH A

PIDNÉERS IN

Stunt Men Risk Their Lives for Thrills

(Continued from page 23)

Prices vary because bump men compete for jobs, while the more experienced experts look on themselves as professional men who should receive adequate compensation for the grave

risks they take.

Several men offered to crash a series of cars for a recent picture, but the studio finally called husky Matt Gilman to wreck nine new sedans in a series of nerve-tingling crashes. No chance to rehearse or shoot retakes—unless the studio wanted to pay for a new automobile each time. During six days of shooting, Gilman drove one car directly in front of a five-ton truck; shoved another through a gurage door while the roof caved in on him; telescoped the third against an embankment at the blind end of a street; trashed the fourth. into a stack of cases filled with canned goods, and can another through a drug-store window. The next four he just "tore up," in a series of collisions with other cars. His only protection from flying glass and splinters lay in a wiremesh windshield, invisible to the cumerus, and a strap beside the seat, which he held to avoid being tossed out of the car.

ONLY one car, the one sacrificed to the Otruck, was specially prepared. With an acetylene turch, the entire cear end, excepting the driving mechanism, was cut through immediately behind the rear seat. Yet, when Gilman was struck by the truck, the back end failed to come off. Instead, the front door flew open and the stant man found himself on the fender, wedged in between the two vehicles. Only a heavy foot on the truck's brake pedal saved him from being crushed to death.

The public suspects that many of these scenes are mere tricks—that dummies, not flesh-and-blood humans, perform the nerve tinglers. Yet in one recent picture, Rose not only planned the stunts and directed six other experienced stant men, but performed as well. Protected only by knee pack and flesh-colored gloves, he jumped through a glass skylight, swung across a room on a chandelier which he caught to break the fall, and landed on the floor thirty feet below; rolled down a twentyfoot stairway; drove an automobile into a cast-iron lamp post, through a plate-glass window, and against a building, fought with Green stop a jail, only to knock him off into the rear seat of an automobile thirty feet below, and jumped from the apex of a high roof into a liny net fifty feet below as fismes burned the supports away.

From a spectator's viewpoint, the fire jump is quite thrilling. In fact, it is one of the most dangerous undertakings of the movie devils. Speed usually saves a stant man when plunging through a giass window, the only danger coming from the possibility of glass splinters reaching the floor ahead of him and sticking on end, with sharp points projecting upward ready to impale the jumper as he lands.

BUT fire! No stunt man likes flames. The other day, Rose stood on the top of a tail, flaming set while Green swing across a gap on a rope in a pretended effort to snatch him from the burning building. Green was supposed to miss, while Rose disappeared into the heart of the fire. Old film helped build up intense heat. Rose watched the flames closely. Timbers started to sag, Below, nearly hidden under the beams, he could see spurks floating down onto the life net. Soon he must jump. The roof moved slightly. The stunt man gave the signal for action, and Green came across, dangling by une hand from the rope. Rose missed his outstretched fingers, jumped backward—and thanked his bucky stars he had taken the precaution to soak the life net with water,

Which stunt is the most dangerous? No stunt man can answer the question, for each has his own pet nightmare. Practically all their exploits are spectacular when viewed on the screen. Some are comparatively easy and relatively safe. Some bring more pain than the stunt men like to admit.

Many stant men "burn out"—some literalty. An African tree hat had been built atop a forty-foot pole on a cliff near Balbon, Calif., eighty-five feet above the pounding breakers, for several equatorial scenes. "Natives" chased Rose through the underbrush of the movie forest, and he climbed the pole to seek refuge from their spears.

As he neared the top, his pursuers touched torches to the grass and bamboo shacks. The pole had been planted too far back from the ocean's edge to permit a jump into the sea, so it had to be pulled over. For this purpose, a



ROCKING the boat is made a safe postime by this new water-sports device. Weights and stabilizing floats make it impossible to bring the saddlelike seat, on its high metal frame, down to the level of the mater.

piano wire, invisible to the cameras, had been run out to a boat, located outside the camera angle.

Meantime, instead of spreading gradually, the flames suddenly burst through the bamboo and licked halfway up the pole. The actor was being suffocated. The pilot of the boat, seeing his plight, started his little craft so suddenly that the wife parted.

The stunt man couldn't climb down through the fire. He tried rocking the pole, hoping it would break at the base. Cameramen remained calm at their posts, grinding on the death scene. They knew there'd be no second chance at this.

Burying his face in his arms, Rose peered downward through the flames. Below, he saw a narrow channel which the sea had cut through the rocks. As a wave rushed in, water covered the hard bottom of the ribbon-like gorge, After ten minutes the pole toppled, falling toward the rocks. Rose leaped sideways as a breaker rolled in, and a ten-foot wall of

water cushioned the stunt man's body against the impact that accmed inevitable. The next wave tossed him like a splinter against the rocks. He was reacued a few minutes later, nearly dead.

IN A recent drama of the West, a cowboy star climbed an oil derrick, pretending to look for bandits in the surrounding country. An explosion was supposed to topple the talk structure into a house near-by. It fell to Gliman's lot to ride the derrick down. When it had fallen half way to earth, Gilman pulled himself over the small superstructure rising above the platform and leaped feet-first through a sixtoot hole previously cut through the shingles of the roof and onto a net, while the derrick crashed loudly through the porch. Later, the star himself was shown hanging by his fingers from a beam inside the room, while carpenters showered splintered wood on him from above.

The stubt men usually work by twos. One skilled pair found themselves on the roof of a movie jail the other afternoon, each doubling for an actor of his own stature and weight. Costumed as a police officer, the lighter man fought with the "heavy" from one end of the sloping metal roof to the other, finally forcing him to loosen his grip on a weakening gutter by beating on his knuckles with an automatic pistol—made of rubber. The victim fell into a net forty feet below, landing easily on his back.

Some scenes do not permit the use of nets to break falls. On such occasions, the stunt men must rely upon their own agility or on the eager hands of other trained stant men to catch them. Yackima Canult fell thirty fest from a burning building and landed on the heads of a crowd, and hardly mussed his hair. On another occasion, a performer came within an ace of meeting death when he fell less than

four feet into a crowd.

Instructed to fail over the infield fence from his mount during a movie home race, he ordered the crowd to stand ten feet back. After placing five layers of green matting, resembling gram, on the ground, he started the race, galloped around the curve, and raised himself in the saddle for the plunge—only to see that the onlookers had moved up to the railing. Too far off his speeding horse to regain his seat, he catapulted headfirst into the mass of men and women. Fifteen extrus were crowded into ambulances as a result of that plunge, but the stuft man escaped with bruised ribs.

THESE unsung performers do not look on a fall from a borse as offering any considerable threat to the soundness of their health, unless it is taken over water. More than one has suffered the agony of falling under a struggling borse after a long drop from a cliff into a pond or lake. The only way to escape the thrashing booves is by swimming under water.

Cliff Lyons sat astride a farm horse, which the company had purchased the day before for \$25, trying to urge him into a sixty-foot leap into a lime quarry at Sonors, Calif., not long ago. For some reason, the animal became skittish and refused to budge. Finally, Lyons walked the horse to the edge of the board chute prepared to fend him off the rocks, when suddenly the animal began to slide, turned a somersault, and threw Lyons from his back. Lyons suddenly found himself diving head-first toward the water, his feet touching the horse as the animal plummeted down, feet in the air, behind him. The stunt man struck the water and the horse struck him, Result: a sprained back for Lynns, and surprise but no injury for the horse,

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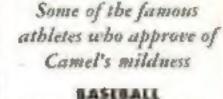


"Camels don't get your Wind"

FAMOUS BASEBALL PLAYERS SAY



"Camels never get my wind of coffic my nerves."



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TRACK AND FIELD

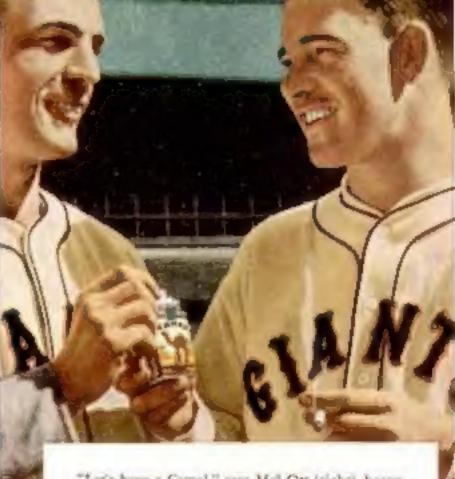
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SWIMMING

Helene Madison Sasan Valas Josephine McKim Stubby Kruger

DIVING

Pete Designation Sam Howard Georgia Coleman



"Let's have a Camel," says Mel Ott (right), heavyhittong Giant outfielder, to his team mase, Harold Schumacher, ace pitcher. Mel says: "I smoke all I want, yet keep in good condition. Camels are so mild, they never get my wind or bother my nerves." And Hal adds: "To my mind that settles it! Camel is the cigarette with real mildness."

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